

# COMMERCIAL FISHERIES *Review*

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COVER: Dogfish sharks. (Photo: R. Brigham)

# COMMERCIAL FISHERIES

## *Review*

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.



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## CONTENTS

	Page
UNITED STATES	
Events and Trends .....	1
States .....	28
ARTICLES	
Fishery Oceanography, by Felix Favorite ....	32
Searching for Tuna, by Thomas Potthoff ....	35
Economic Effects of Regulations in Maryland	
Oyster Fishery, by Richard E. Suttor and	
Thomas D. Corrigan .....	38
BOOKS .....	42
INTERNATIONAL .....	45
FOREIGN	
Canada .....	48
Europe .....	50
Latin America .....	58
Asia .....	61
Mid-East .....	66
South Pacific .....	66
Africa .....	67
INDEX .....	73



Lobster catch in North Atlantic aboard BCF's 'Delaware.' (Photo: R. C. Wilson)

# U.S. GROUND FISH INDUSTRY HURT BY IMPORTS

"It is evident that the United States groundfish fishermen are suffering economically from a cost-price squeeze precipitated by the depressing effect of large quantities of imports on groundfish prices," Secretary of the Interior Walter J. Hickel wrote to President Nixon on May 21. The Secretary introduced the report of a study by BCF economists. The study had been asked by major parts of the industry concerned over the effects of imports and of changes in U.S. tariff structure for groundfish products.

"During recent years," Mr. Hickel added, "both total and per capita consumption of groundfish increased continuously; imports of groundfish doubled; while the quantity of fish landed by United States vessels and the number of fishermen employed declined."

The report--"The Effects of Imports on the United States Groundfish Industry"--covers cod, cusk, haddock, hake, ocean perch, and pollock. Flounder was added to meet many requests. Groundfish live on or near the ocean bottom. On the Pacific Coast, they are called bottomfish.

Fillets and blocks are the principal forms in which species are imported. Fillets are the sides of fish cut lengthwise, separating flesh side from skeleton. They are marketed fresh, frozen packaged, breaded and frozen--or frozen into blocks for more processing.

Blocks are fillets and other parts frozen into blocks. Each block weighs 10 or more pounds. Frozen blocks are used to prepare fish sticks, portions, and other processed products.

## REPORT HIGHLIGHTS

- In 1967, U.S. landings of groundfish were 427.4 million pounds--a 25% drop from 1954. Overall, landings have "trended downward" at annual average rate of 4.5 million pounds, although Pacific coast landings have been "fairly constant."

- In 1967, U.S. processors produced 121.5 million pounds of fillets and steaks, 4% below 1956-58 annual average. (Steaks are  $\frac{5}{8}$ - to 1-inch-thick cross-section slices from large dressed fish. They are sold fresh and frozen packaged.)

- From 1956 to 1967, consumption of groundfish rose 48%--from 315.8 to 468.8 million pounds.

- During 1954-67, groundfish imports increased sharply. Imports were 107% higher in 1967 than in 1954-56: in frozen fish blocks and slabs for processing industry. In 1956, U.S. imported less than half the groundfish it used--but now imports more than two-thirds.

- In 1966, vessels catching groundfish employed 3,778 fishermen--down 347 from 1957.

- Rapidly increasing imports in 1953-67 resulted in a current price about 1.6 cents per pound lower than would be true if imports had the same relative relation to total consumption that they had in 1947-52.

- From 1956-58 to 1967, costs of catching and processing rose 35-40%. Exvessel price of fish increased 24% or less during 1953-55 to 1967. Catch rates did not improve, so domestic industry has been caught in a cost-price squeeze.

● U.S. Tariff Commission investigations in 1954 and 1956 found serious economic injury from imports to groundfish industry. The BCF study, which covers 1956-1967, found further deterioration "due in a large part to rising imports."

Groundfish imports in blocks and slabs have boosted total imports. They are cutting into basic markets for U.S.-caught groundfish. Per-capita consumption of fillets and steaks has fallen because sticks and portions have been substituted. Industry's fishing segment has not grown with stick-and-portion processing business. A principal reason appears to be industry's inability to compete with foreign block and slab products. Foreign costs of catching fish are lower: 1) lower vessel-construction costs; 2) subsidies to fishermen.

People in the industry are concerned about its future, particularly the future impact of concessions made in the Kennedy Round tariff negotiations. Lower customs duties on frozen blocks and slabs are expected to "intensify the present adverse cost-price squeeze."

The 1956 Tariff Commission study had found serious economic injury, so the duty on fresh and frozen groundfish fillets was exempt from the Kennedy Round. But recent technological developments cutting costs have made it easier for Canada to export to U.S. fresh groundfish fillets and steaks. Limited data reveal that Canadian exports to the U.S. in 1967 of these products were 14.1 million pounds; in 1961, the figure was only about 5.6 million pounds. This influx of fresh products appears one of the immediate and major concerns of industry; it threatens the domestic industry with loss of a large part of that market.

Industry consists of fishermen operating principally otter trawl vessels; fish processors; a marketing system serving U.S. and world markets; and suppliers to fishing vessels.

#### Fishing Areas

The principal grounds are over the Continental Shelf of Northwest Atlantic and North Pacific Coast. Over  $\frac{3}{4}$  of U.S. catch is landed on east coast, mainly New England ports. Landings in the west are concentrated in Oregon and Washington.

The NW Atlantic area, which extends from Long Island, N.Y., to Newfoundland, covers about 260,000 square miles. It includes the very productive areas of Georges Bank, Browns Bank, Nova Scotia Banks, and Grand Bank. Most of U.S. catch is from Georges Bank, which is fished intensively also by foreign vessels. Large- and medium-sized U.S. vessels fish these areas about 50 or more miles out. Smaller U.S. vessels normally fish close to Massachusetts and Maine. In 1967, about 312.1 million pounds of groundfish were landed at New England ports, half of all fish landed there.

Pacific groundfish are caught from Santa Barbara, Calif., to northern British Columbia. California forbids extension of groundfish operations south of Santa Barbara. In 1967, U.S. vessels caught about 69.5 million pounds--6% of all west coast landings.

#### GROUNDFISH PRODUCTS

Groundfish are marketed from whole or eviscerated fresh (unfrozen) fish to highly processed convenience food forms: breaded-precooked fish sticks or fish portions. More processed products have been emphasized

increasingly in recent years. Fish sticks and portions now comprise over 60% of total U.S. processing of packaged groundfish products; in 1958, the figure was less than 40%. But the marketing of fresh groundfish fillets also has increased significantly. So frozen fillets now comprise only 17% of all packaged groundfish--compared to about 40% in 1958.

From the dollar standpoint, significant increases have taken place in the relative marketings of fresh flounder and haddock fillets--with a corresponding decline in frozen Atlantic ocean perch fillets.

#### GROUNDFISH CONSUMPTION

Groundfish consumption has been increasing steadily in the past 15 years. In 1967, it was about 48% higher than in 1956. Increasing population and per-capita use produced it. The relative importance of different products has changed: the greatest increase was in groundfish blocks, the raw material for the rapidly growing fish-stick-and-portion industry. As use of groundfish blocks increased substantially, consumption of cod and haddock fillets declined. Only flounder fillets increased steadily. Per-capita consumption of ocean perch trended downward slightly.

#### GROUNDFISH LANDINGS

During 1954-67, U.S. groundfish landings averaged 517 million pounds annually. However, landings declined an average annual rate of 4.5 million pounds: around 5 million on Atlantic coast; on Pacific coast, landings fluctuated widely but trended upward slightly.

Overall decline in groundfish landings resulted primarily from the great drop in quan-

tity of Atlantic ocean perch and declines in pollock and haddock. Only Atlantic coast flounder and Pacific coast ocean perch landings increased.

Resource abundance was not a factor. The major decline was in production of ocean perch--due to less fishing effort, which resulted from cost-price squeeze on fishing vessels. On the other side of the ledger, increased abundance of yellowtail flounder resulted in increased landings in 1962 and 1963.

In Northeast Pacific, foreign fleets have increased greatly in the past 10 years, yet a much larger harvest could have been taken by U.S. from demersal species. Trawlers are capable of increasing the harvests of bottom-fish, but cost-price relationships have kept U.S. fleet from expanding its catches.

#### Domestic Fillet, Steak, & Block Production

Most U.S. landed fish is processed and sold as fresh or frozen fillets. Domestic block production, though increasing, is still only about 6 million pounds a year. Fresh (nonfrozen) fillet production is trending upward; frozen-fillet production is declining correspondingly.

Flounder-fillet production is increasingly important: over  $\frac{1}{3}$  of U.S. production of groundfish fillets, steaks, and blocks.

#### GROUNDFISH IMPORTS

Groundfish are imported primarily as fresh and frozen fillets and steaks--and frozen blocks and slabs. In 1967, imports of these groundfish were 316.9 million pounds, double the 1956-58 annual average. The figure was 68% of U.S. consumption of groundfish in 1967.

## Blocks

Beginning in 1960, imports of groundfish blocks and slabs exceeded fillets and steaks. In 1967, frozen block and slab imports were 189.5 million pounds, almost 4 times the 1956-58 annual average. However, since 1965, block-and-slab imports have declined slightly. These imports have fed the developing fish-stick-and-portion industry that began in the early 1950s. In 1967, the U.S. produced only 6.2 million pounds of blocks and slabs--about 3% of imports.

## Fillets and Steaks

In 1967, imports of groundfish fillets and steaks were 127.4 million pounds, a rise of 18% from the 1956-58 annual average. Continued growth in imports of fresh fillets "will likely make major inroads" into markets for U.S.-produced fresh groundfish products, one of principal outlets for U.S. fleet.

## Imports in Relation to Consumption

As imports grow and landings by U.S. groundfish fleet decline, imports have become the larger part of U.S. groundfish consumption. In 1965, 1966, and 1967, imports reached nearly 70% of groundfish consumption. In 1956-58, imports were less than half of groundfish use.

## Imports by Species

In 1967, imports of ocean-perch fillets and steaks of 36.3 million pounds were the largest of any other species. Cod fillet and steak imports were 32.1 million pounds. The remaining species totaled 59 million pounds. In fillet-and-steak category, only imports of

ocean perch and flounder have been rising in recent years. In 1967, 33.3 million pounds of flounder fillets were imported--235% of 1956-58 annual average.

## Exporters to U.S.

The principal exporters of groundfish blocks and fillets to U.S. are Canada, Iceland, Norway, Denmark, W. Germany, and Greenland. Canada and Iceland provide about 90% of U.S. groundfish imports as fillets and steaks.

## GROUNDFISH PRICES

The BCF report states: "The impact of imports on domestic prices ranges from actually depressing prices in short-run periods to offsetting some of the effect of increasing demand on price in longer-run periods. This tends to limit the rate of price increase in the long run."

On Atlantic and Pacific coasts, from 1953-1967, prices received by fishermen at dockside (exvessel prices) trended upward. But a comparison of harvesting costs during this period shows these rises have been less than increases in costs. Costs in 1967 were 35-40% above 1956-58; prices increased only 24% between 1953-55 and 1967. Production costs of groundfish species that make up 97% of the landings increased more than exvessel prices; only pollock prices increased more than costs.

## Wages

During 1958-67, wages of fish processing-plant workers increased steadily. Rising labor costs in the processing industry and

the retarding effect of imports on wholesale and retail prices have slowed the rate of increase in exvessel prices. This has produced a cost-price squeeze at the harvesting level.

In 1966, the costs of catching fish by Canadian trawlers were 60% below U.S. costs. Lower labor and vessel-construction costs were principal reasons. Despite transportation costs, Canadian products had "substantial price advantage" in U.S.

#### Effects of Imports on U.S. Prices

Imports have an "overall dampening effect" on domestic prices. One analysis showed that the "current price for groundfish is about 1.6 cents a pound lower" than if imports were same proportion of total consumption that they had been in 1953-67. Downward pressure on prices and the resultant decreased income for the sale of groundfish by vessel owners "contributed to making many vessels unprofitable to operate."

The report explains how imports are increasing cost squeeze: "Thus, the domestic fisherman is in a squeeze between increasing costs and imports in that as domestic prices rise, imports are likely to rise significantly and thus exert downward pressure on domestic prices. This is the likely explanation for

the small percent increase in price in relation to increasing costs over the past decade."

#### Wholesale Prices, Frozen Blocks & Slabs

In 1967, imports of frozen blocks and slabs of groundfish were about 60% of groundfish imports. Prices averaged 22.9 cents per pound. In 1956, average annual price was 18.8 cents per pound. The average price for 1965-67 was 26% over 1956-58.

#### Fillet & Steak Prices

In 1965-67, the average price of U.S.-produced fillets and steaks was 44% above the 1956-58 average price. Prices of imported groundfish fillets were about 38% above 1956-58 average price.

#### JOBS

##### Atlantic Coast

In the Atlantic groundfish fleet, the number of fishermen dropped 12%: from 3,316 in 1957 to 2,912 in 1966. "This was a consistent year-after-year decline with the exception of 1966."

In the Boston fleet, one of the major groundfish fleets, the average hourly wage rate is below U.S. average for workers in nonsupervisory jobs in mining, contract construction, and manufacturing. Full-time

deckhands, on the average, had to work 3 hours for every 2 hours by other industry workers.

Most full-time fishermen--over 2,520 hours per year--"earned well over \$6,000 from commercial fishing," near the U.S. median of \$6,283 for all "year-round" full-time male workers. Most of those fishermen who worked between 1,560 and 2,520 hours earned less than \$4,000. However, the report makes clear, "it is important to note that fishermen are required to work an average of 60 hours per week in order to achieve a standard level of income. Those who worked

the national average earned an income which was almost half the national standard."

In 1964, 83% of U.S. labor force was under 55 years; only 38% of Boston's fishermen was under 55.

#### Pacific Coast

During 1957-66, despite annual fluctuations, there were no important changes in the number of fishermen in the Pacific coast trawler fleet. However, for 5 straight years before 1966, the number had trended generally downward. In 1966, there was a sharp increase.



#### WHO OWNS THE WATER AREAS OFFSHORE AND HOW FAR?

Ownership of offshore waters is one of the major problems to be resolved before the sea can be exploited peacefully. No country owns the floor of the open ocean. In the past, the traditional limit was 3 nautical miles, the effective distance a cannonball could be fired in the days of sailing vessels.

Now nations choose a distance between 3 and 12 miles from their shores. Within these limits they may exercise control of shipping; there is, however, no clear requirement for other nations to recognize this sovereignty. The United States recently changed its territorial water claim from 3 to 12 miles.

Although waters were originally designated territorial for defense purposes, nations are now also concerned with protecting their fishing and mineral rights. The continental shelves are important for future harvest of marine life and minerals. The Geneva Convention of 1958 provides for a nation the sovereignty over its continental shelf to a depth of 200 meters or to the depth of exploitation of natural resources. Several Latin American countries have made claims of exclusive fishing rights to a distance of 200 miles from their coasts. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

# UNITED STATES

## Secretary Hickel Aids New England Haddock Fishery

Secretary of the Interior Walter J. Hickel determined on June 19 that a commercial fishery failure due to a resource disaster had occurred in the New England haddock fishery. The fishery has declined significantly since 1965. Secretary Hickel cited the Commercial Fisheries Research and Development Act of 1964, which authorizes funds to assist a commercial fishery struck by a resource failure.

Research by BCF, which administers the Act, showed that haddock spawning has been very poor since 1965. Heavy exploitation, in large part Soviet, contributed to the decline.

From 1935-1963, average annual landings were 50,000 metric tons; for 1969, predicted landings are less than 10,000 metric tons.

Governors of several New England States, Congressmen, and the fishing industry, expressing concern over the haddock industry, have urged Federal assistance.

### Many Fishermen Hit

Secretary Hickel stated that more than 90 New England fishing vessels, primarily from Boston, Gloucester, and New Bedford, Mass., normally depend on haddock for over 50% of their catches. They now face a severe loss of income. Also, nearly 400 other vessels that make incidental catches of haddock face losses.

One remedial measure proposed by BCF is to divert fishing effort to pollock, an underutilized species. BCF's 'Delaware II' and cooperating industry vessels already are testing the effectiveness of gear adapted especially for catching pollock.

BCF marketing specialists are working with industry to increase consumer acceptance of pollock as a replacement for haddock.



## BCF Estimates Sustained Yield & Use of Pacific Hake

The maximum annual sustained yield of Pacific hake from southern Oregon to Cape Spencer, Alaska, is 300-540 million pounds. This is the rough estimate of BCF scientists.

In 1966, Soviet hake catches were 300 million pounds; in 1967, 350 million.

### U.S. Hake Fishery

There is no U.S. fishery on this offshore stock. U.S. fishermen, however, have been engaged in a small fishery in Puget Sound. They have landed an annual average of 8 million pounds.

During 1964-1967, these were the total Pacific hake catches and the Puget Sound catches:

	Total Pacific Hake	Puget Sound
	..... (Pounds) .....	
1964	878,000	715,800
1965	3,146,000	1,527,900
1966	11,833,000	8,032,200
1967	28,818,000	9,564,900

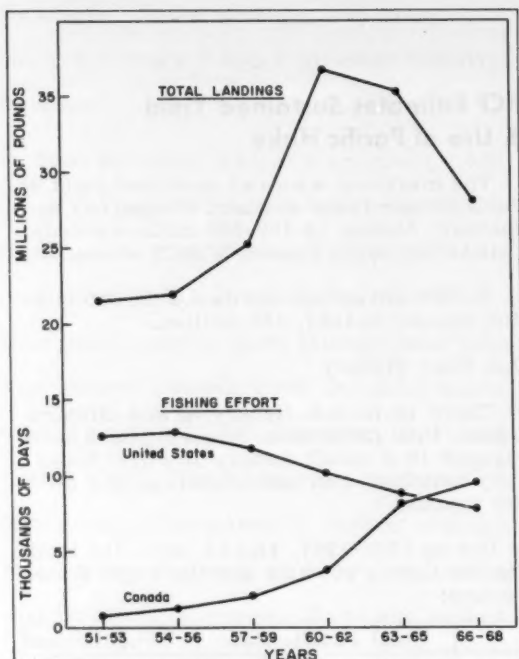
### Hake Potentially Useful

Pacific hake are potentially useful as human and animal food. So BCF believes it important to continue studying and monitoring the resource to evaluate the effects of these levels of exploitation.



## U.S. Atlantic Coast Sea Scallop Fishery Declines Further

The decline of the United States fishery for sea scallops and the rise of the Canadian fishery continue, reports J. A. Posgay, BCF Biological Laboratory, Woods Hole, Mass. The U.S. share of this fishery was only 45% in 1966-68, compared to 94% in 1951-53. In 1951-53, total annual landings were 21.5 million pounds of meats. These rose to 36.7 million pounds in 1960-62, and dropped to 28 million pounds in 1966-68.



Average annual landings and fishing effort in the Atlantic coast sea scallop fishery by three year time intervals.

Trend in Atlantic Coast Sea Scallop Fishery					
Years	Fishing Effort (Thousands of Days/Year)				Average Annual Landings Millions of Lbs.
	U.S.	Canada	Total	%U.S.	
51-53	12.6	0.8	13.4	94	21.5
54-56	12.9	1.3	14.2	91	21.9
57-59	11.8	2.0	13.8	85	25.3
60-62	10.1	3.7	13.8	73	36.7
63-65	8.8	8.1	16.9	52	35.4
66-68	7.8	9.5	17.3	45	28.0

There also has been an interesting diversion of the fishing effort. In the earlier years, Georges Bank (ICNAF Subarea 5) supplied most of the landings; but, since 1965, the U.S. fleet has abandoned Georges Bank to the Canadians and concentrated on the Middle Atlantic grounds (ICNAF, Statistical Subarea 6).



## Incidental Catch Lowered for Yellowfin Tuna

BCF has announced that tuna bait boats in the regulated area of the eastern Pacific Ocean are restricted to an incidental catch rate of 15% for yellowfin tuna taken with other tuna--and with bonita, billfishes, and sharks. Bait boats are tuna boats that use hooks and lines.

Regulations published in the Federal Register, May 3, 1969, permitted bait boats fishing regulated area during closed season to land yellowfin tuna up to 50% of vessel capacity, or 130 tons per vessel, whichever was less, until a total of 1,500 tons was reached.

Also, the regulations provided that when limit was reached, the incidental catch of yellowfin would revert to 15% maximum.

An announcement that the 1,500-ton limit was reached appeared in the June 11 Federal Register. The limitation became effective on June 13.



## Purse Seining for Winter Industrial Fishery Deemed Impractical

Purse seining is not economically feasible for the menhaden industry to catch a winter supply of industrial fish in the mid-Atlantic coastal area. This is a preliminary finding of a study by the Virginia Institute of Marine Science (VIMS) under a grant from the Bureau of Commercial Fisheries. The purse seine is used to catch dense schools of menhaden during spring, summer, and fall.

Dr. Jackson Davis, head of VIMS' Ichthyology Department and of the study, said menhaden have been in short supply lately along mid-Atlantic shores. They are not available at all during winter and spring when they are thought to be in deeper waters. If other fish could be harvested for manufacture into industrial fishery products during this off-season, the industry could operate year-round. The possibility of using sea herring as an alternate was evaluated. Sea herring, cousin to the river herring caught by the millions in Chesapeake Bay each year, offers great potential.

## Cape Hatteras-Block Island Study

Cruises were made in the area from Cape Hatteras, N. C., to Block Island, Rhode Island, from February through May in search of sea herring and mackerel. Most explorations were along the inner two-thirds of the continental shelf, but deeper water up to 4,800 feet also was checked. Davis reported modern electronic fish-finding equipment located schools of fish averaging less than 50 yards wide. These were mostly along the 30-fathom contour, where foreign vessels also were fishing.

### Schooling During 2 Periods

Sea herring and mackerel were plentiful but were too scattered most of the time to make harvesting practical with a purse seine. The seine is effective when fish concentrate in dense schools. But fish did school briefly during 2 periods of the day: just before dawn and again just before dusk.

During first period, schools broke up into very small groups with dawn's first light. These groups settled to the bottom and remained there until late afternoon. During second period, fish schooled up in later afternoon but stayed deep until sunset. Then they rose quickly to the surface and scattered.

Schooling lasted no more than 4 of each 24 hours. In March, these fish were south of the Virginia Capes; by May, they had moved to just south of Long Island. This migration pattern is typical of fishes that winter in the mid-Atlantic. Harsh winter weather hampered experimental fishing. Only 40% of the scheduled work days were calm enough for purse boats to operate.



### Shrimp-Separator Trawl Tests Continue

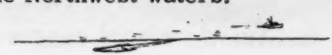
The M/V 'Baron,' chartered by BCF's Seattle (Wash.) Exploratory Base, recently completed fishing efficiency studies of 6 different designs of experimental shrimp-separator trawls.

Conclusions drawn from the field testing included: (1) The optimum mesh sizes for use in the capture of pink shrimp appear to

be 1 to  $1\frac{1}{8}$ -inch in the outer portions of the body and  $1\frac{1}{2}$  to 2 inches in the separator panels. (2) All separator trawls require weighting with chain to facilitate fishing near bottom. (3) Optimum-sized catches of shrimp appear to be related to the height of footrope over the bottom. (4) The 10- to 12-foot trash chutes resulted in best performance. (5) The separator trawls harvest nearly pure shrimp of much better quality than those taken in conventional trawls simultaneously with much greater quantities of fish and debris.

### Future Testing

Future field work will capitalize on these findings and center on 2 of the separator trawl designs tested that showed more promise than the others. The objective of future testing will be to increase shrimp catch rates of the separator trawl to equal, or exceed, those of conventional shrimp trawls used in Pacific Northwest waters.



### Certain Sounds Attract Sharks

Some of the sounds that attract sharks have been determined by researchers at the University of Miami's Institute of Marine Sciences. They also discovered that the lemon shark can perceive the displacement of water due to the passage of sound waves. This shark may use the information and pressure signals to locate prey.

Irregularly pulsed signals, 800 Hz and below, accounted for over 370 shark sightings. The tests were conducted by A. A. Myrberg Jr., J. D. Richard, and Arnold Banner. They used the Institute's underwater video-acoustic installation off North Bimini.

### The Operation

Most sharks appeared at the test site in 11 to 54 seconds from onset of the signal. The signal was a low-frequency sound simulating one made by a struggling fish. On a screen inside a dry laboratory, the researchers observed various species approaching the underwater sound projector and television: the sharpnose, reef, nurse, and a silky or dusky shark. As sharks increased, their swimming activity resembled a feeding frenzy. No sharks appeared at test site when either pure tones, or signals with components only



Underwater Television. (Ed Fisher)

above 100 Hz, were generated by the sound projector.

#### Shark's Receptors

Dr. Myrberg said: "Because these sharks detected the signals, apparently oriented quickly to them and rapidly reached the test site, the importance of certain acoustic stimuli to these animals is assured. Our work has also revealed that the lemon shark can perceive displacement of water due to the passage of sound waves. All sharks have a great many displacement receptors arranged along their lateral line or scattered about their bodies. . . ."

#### Underwater TV

A unique underwater television enables the researchers to observe sharks on a screen in the Institute's small monitoring station at North Bimini. (Diving in a test area may influence animal behavior.) The TV is mounted on the sea floor at 60 feet about a mile off the coast. It can scan the underwater scene 360 degrees horizontally and 70 degrees vertically. It has a zoom lens for closeup to wide-angle viewing. Periodically, the TV's dome is automatically cleaned by a "windshield wiper" impregnated with a toxic material.

"The underwater installation also includes hydrophones, acoustic projectors, and an environmental sensor system that records temperature, current, and turbidity information. All of the instruments can be monitored and controlled by researchers in the laboratory."



### National Water Commission to Consult With Governors

The National Water Commission (NWC) will hold a series of conferences Aug. 26-Nov. 7--6 regional and 1 national--on its tentative program of studies, Charles F. Luce, Chairman, announced on June 27.

The Commission is inviting the 50 Governors and representatives of municipal and intergovernmental water agencies and private organizations.

NWC is a nonpartisan group of 7 private citizens appointed by the President. It has a 5-year statutory assignment to develop an overall national water policy.

#### NWC's Job

The law establishing NWC directs it to review present and future U.S. water problems, assess future water needs, and identify several ways of meeting these needs. Also, it requires Commission to consider both economic and social consequences of water resource development. These include impact on regional economic growth, institutional arrangements, and on esthetic values.

Luce emphasized that the Commission's approach will recognize that it is impossible to consider water-resource development as an independent problem. This problem must be viewed as an integral part of a great U.S. effort to protect and improve the quality of man's environment.

#### Regional Conference

Luce said the main purpose of the regional conferences will be to get the views of state, local agencies, and organizations on the scope of NWC's tentative program of studies. The 2-day Washington conference will include national nongovernmental organizations

concerned with water-resource care and development. More than 50 nationwide associations, clubs, societies, etc., will be offered a chance to submit statements or to appear.

The conferences will be open to press and public. Participants will be encouraged to file written statements and to avoid long talks.

Luce wrote to the governors that the act establishing NWC "requires the Commission to consult with the Federal Water Resources Council (FWRC) and to furnish its reports to that body for review and comment prior to their submittal to the President and the Congress."

He added: FWRC was "primarily an organization for coordinating the work of the agencies that actually plan and carry on the Nation's water activities impartially, without being involved in day-to-day operations, and to recommend improvements in policy, procedures, and institutional arrangements."



## BCF Lists Wrecks on Georges Bank & Nantucket Shoals

BCF's Fishing Vessel Safety Unit has listed the location of 36 fishing-vessel wrecks known to lie on or near productive fishing grounds off Georges Bank, Nantucket Shoals, and South Channel. Latitude, longitude, and depth in the immediate vicinity are included. The list will be distributed to the fishing industry of New England and fishermen using these areas for otter-trawl fishing.

With few exceptions, the vessels were sunk during the past decade. Reports of hang-ups and loss of fishing gear resulting from encounters with the wrecks have been reported by many fishermen.

Copies are available to the fishing industry from BCF, 408 Atlantic Ave., Boston, Mass. 02210.



## Conferences Scheduled

The 22nd annual meeting of the Gulf and Caribbean Fisheries Institute, sponsored by the University of Miami's Institute of Marine Sciences, will be held at the Carillon Hotel, Miami Beach, Fla., Nov. 16-20, 1969. For more information, write to Executive Secretary, Gulf and Caribbean Fisheries Institute, 10 Rickenbacker Causeway, Miami, Fla. 33149.

The 14th annual meeting of the International Game Fish Research Conference, sponsored by the International Oceanographic Foundation, will be held at the same hotel, Nov. 21-22, 1969. Write: International Oceanographic Foundation, 10 Rickenbacker Causeway, Miami, Fla. 33149.



## U.S. Fishery Products to be Promoted at Overseas Trade Shows

BCF has invited producers and processors of fishery products to participate in two overseas food trade fairs this fall. Bureau personnel will coordinate all efforts to introduce and promote U.S. fishery products at the shows. Fishery products must be U.S.-caught, or processed in the U.S. to be eligible. Floor space, adequate storage space, and interpreter services will be provided free. Participating firms are not required to send representatives.

H. E. Crowther, Bureau director, said that the purpose of the overseas trade shows is to develop and expand foreign markets for U.S. fishery and agricultural products. The Bureau has participated in 20 previous trade fairs, which have attracted leading tradespeople in Europe.

The shows are scheduled for Sept. 3-8 in Brussels, Belgium, and Oct. 4-10 in Cologne, Germany.

Participation agreements will be accepted on a first-come, first-serve basis. Deadline for receipt of the agreements is August 1. Further information may be obtained from Office of International Trade Promotion, Bureau of Commercial Fisheries, 1801 N. Moore Street, Rm. 401, Arlington, Va. 22209. Telephone: area code 703, 557-4731.



## Certified Shellfish

J. David Clem

People who eat oysters are usually more familiar with the injunction to avoid this favorite seafood in the "non-R" months than they are with the unique public health problems associated with these molluscan shellfish. These problems of food sanitation and safety involve edible molluscan shellfish, especially fresh and frozen oysters, clams, and mussels, and arise because of the peculiar life cycle and environment of these marine animals.

For 44 years, the shellfish problem has been accorded official recognition in the creation and continuance of a voluntary three-way (State, Federal, and industry) consumer protection activity known as the National Shellfish Sanitation Program. Last July, the Program was transferred to the Food and Drug Administration as part of FDA's new Bureau of Compliance.

Why public health officials are concerned over these shellfish involves many facets, including reproduction and growth habits, methods of harvesting and processing, and other problems that have troubled the shellfish industry since the turn of the century.

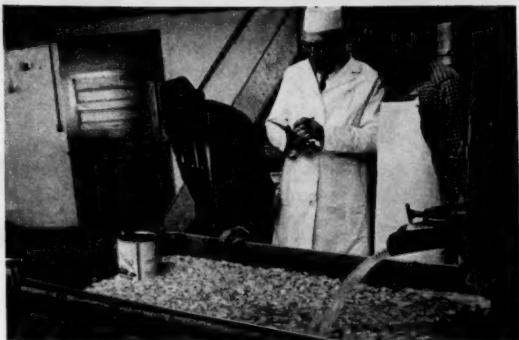
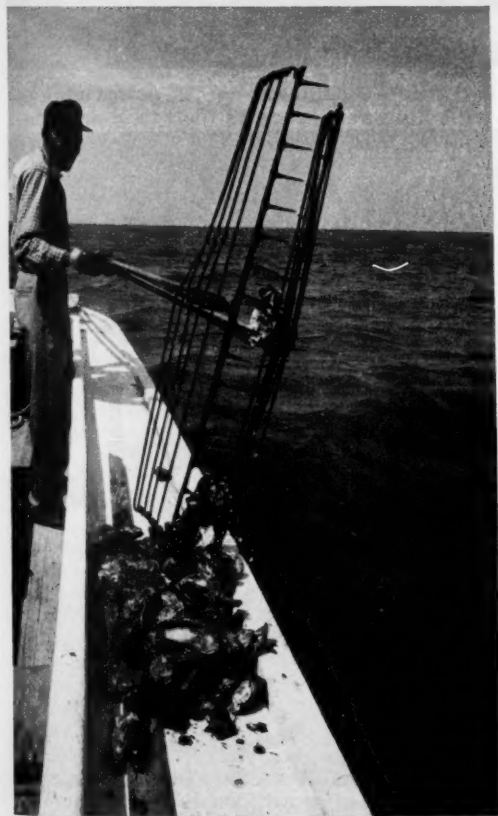
Oysters, clams, and mussels must breed and live in estuarine waters. The estuary, defined simply, is a coastal zone where sea water and fresh water mix. These mollusks feed by pumping estuarine water through their gills, filtering into their digestive systems such substances as algae, detritus, bacteria, and whatever other suitable sized particulate and dissolved matter might be present. An oyster, through movement of its cilia, can transport water through its crude but highly coordinated anatomy at the rate of 20 liters an hour. This feeding action, however, concentrates substances with little selectivity. Therefore, the chemical and microbiological quality of a mollusk's visceral mass is a reflection of the quality of the estuarine water it inhabits. If the water is polluted, so is the mollusk. It is because of the ecology of these marine species and their method of feeding, along with the continuing degradation and pollution of our estuarine waters and our habit

of eating shellfish in a raw or partially cooked state, that special health controls have had to be imposed and enforced.

Oyster production in the United States reached a peak in 1910, before the present sanitary control program began. Its decline since that time has been caused by an excess of indiscriminate harvesting and exploitation of this natural resource, uncontrolled pollution of many shellfish waters, shellfish diseases, a meagerness of technological advances in production, and an increasing lack of consumer confidence in the sanitary quality of shellfish. Human consumption of sewage-polluted shellfish has caused numerous outbreaks of infectious disease. Because there were no sanitary controls, the consumer could never be sure that the oysters, clams, or mussels he was purchasing were safe to eat. Consumer concern was voiced in an editorial in the 'Journal of the American Medical Association' in 1905: "Consumers of raw oysters at present are quite at the mercy of oyster dealers, presumably of varying intelligence and conscientiousness. There should be some means of preventing the distribution of sewage-saturated oysters in any part of the country. Is this something that the Public Health and Marine-Hospital Service should take up?"

Despite the AMA editorial suggestion, it took 20 years and an unprecedented outbreak of disease to prompt action in shellfish sanitation. Late in 1924, major typhoid fever outbreaks occurred, resulting in 1,500 cases with approximately 150 deaths, all traced to the consumption of contaminated oysters. The country was shaken by what later became known as the "oyster scare." Sales dropped dramatically. In 1925, the Surgeon General of the Public Health Service called a conference of representatives from the shellfish industry, the Department of Agriculture's Bureau of Chemistry (now FDA), the Commerce Department's Bureau of Fisheries, State conservation agencies, and State and local health agencies. This conference marked the beginning of an unparalleled cooperative agreement in the form of measures

The author joined the Food and Drug Administration in 1968 as Chief of the Shellfish Sanitation Branch in Bureau of Compliance. Article reprinted from FDA PAPERS May 1969.



The Chesapeake Bay between Maryland and Virginia and the bay's tributaries are plentiful in both oysters and clams. Oysters are harvested with both hand tongs and power dredges, and oystermen use both sailboats and power boats under State regulations covering each operation. On Maryland's Nanticoke River (2 and 3), workers tong up oysters and cull or discard those under legal marketable size. The bay and rivers are patrolled by Maryland Marine Police for illegal oystering in uncertified waters and for other violations such as those involving times and methods of harvesting. Power dredging for oysters in the Nanticoke is shown (4). The oysterman on the pier (1) is tending a "wet storage" operation in which harvested oysters are suspended live in "float" containers under water by use of ropes and winches until ready for processing. In a processing plant (5), shucked oysters are washed with clean ice water in a

(Continued following page.)



"blow tank," which removes impurities and brings temperature down to 38-40° F. for storage and shipping. Checking are William Russell (center), FDA Baltimore District Inspector, and Frank Hobbs (right), Chief, Shellfish Section, Maryland Department of Health Division of Food and Milk. Live whole clams are desanded in clean salt water treated with chlorine and ultraviolet light to kill bacteria (6). The chlorine is later removed from the water. Mr. Hobbs (right) watches with the plant owner and a plant employee. Clam shucking is shown in a packing plant (7). Charles Harmon, a Wicomico County sanitarian's aide, takes a sample of water (8) from the bottom of an oysterbed for coliform bacteria analysis. Detail (9) shows how the stopper stays in the bottle until the holder hits bottom, is unstopped when tension is released on the string, and restoppered when lifting retightens the cord.

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to insure the future safety of shellfish. Both the concepts and the agencies represented at the conference are still very much in evidence today in the National Shellfish Sanitation Program--a consumer protection program that has made considerable progress in strengthening sanitary controls, administrative procedures, and State regulatory activities.

Each member of the National Shellfish Sanitary Program's three-way State, Federal, and industry partnership has a defined area of responsibility. The basic premise of the Program is that coordination and uniformity of control may be achieved best by mutual agreement among the States, which individually bear the chief responsibility for the sanitary control of the shellfish industry. The Federal Government coordinates program activities through the Food and Drug Administration, which assumed the shellfish sanitation function after a reorganization within the Public Health Service. FDA is responsible for operating the Federal Government's share of the program through administrative and technical machinery in its new Bureau of Compliance. A Shellfish Sanitation Branch has been established and staffed with personnel who were associated with the program in its former PHS location.

All the coastal shellfish-producing States participate in and subscribe to the procedures outlined in the National Shellfish Sanitation Program's manuals of operation, which have been published by the Public Health Service. The States have adopted uniform rules and regulations administered principally by health and conservation agencies for the sanitary control of the shellfish industry. Their responsibilities span a total range of controls which begin at the shellfish growing areas and continue through the processing and distribution phases. Typically, a shellfish control agency makes sanitary and water quality surveys of growing areas, classifies and patrols closed shellfish waters, inspects harvesting methods and shellfish plants, makes laboratory investigations, and provides any additional surveillance measures necessary to assure that the shellfish that reach the consumer have been grown, harvested, and processed under sanitary practices. The State health departments issue operating certificates to those shellfish shucking, packing, repacking, and shellstock plants whose equipment, method of operation, basic construction, and product meet cooperative program

standards. Every package of fresh or frozen oysters, clams, or mussels shipped in interstate commerce from a State certified plant has been marked with an identifying number preceded by an abbreviation of the State name. These "certified shellfish" are guaranteed to have been grown, processed, and packaged under strict sanitary controls.

It is not easy for States to apply the necessary controls. Trained and experienced personnel are needed in the biological and physical sciences, public health, engineering, law enforcement, and several other disciplines to effectively administer an adequate sanitary control program. State agencies employ a total of 1,200 such personnel, either full or part time. The bulk of their effort is in making comprehensive surveys and resurveys of shellfish-growing waters, and preventing illegal harvesting of shellfish from closed areas. A joint study by the Public Health Service and States in 1965 disclosed that two million acres of shellfish waters have been closed or restricted to the taking of shellfish. A total of 8.2 million acres are approved. The national trend is to close more estuarine waters where the shellfish grow, because they fail to meet the rigid water quality requirements of shellfish-approved waters.

FDA's part in the Shellfish Sanitation Program is not only a continuation of former PHS activities, but also a strengthening of the coordination and assistance given to a State program. The FDA field staff, headed by Regional Shellfish Consultants in the six HEW Regions that have coastal waters, will continue to conduct annual evaluations of State control programs. Each review will include an analysis of the legal and general administrative procedures, inspection of a representative number of shellfish plants, and review of laboratory procedures and the effectiveness of closed area patrols. From the information thus obtained, Federal endorsement of a State program is either given or withheld, depending on the State program's degree of compliance with national program standards. This regulatory procedure is a strong incentive for the State control agencies and the shellfish industry to encourage and follow good sanitary practices and to comply with the Manuals of Recommended Practice, issued jointly with the National Shellfish Sanitation Program participants.

Every 2 weeks, the FDA will be issuing the familiar national list of some 1,400 State-certified interstate shellfish shippers for the information of food control officials throughout the country. FDA would like to see a greater distribution and use of this list to assure that consumers get shellfish from certified sources.

Cooperative efforts to combat pollution of the water habitat of shellfish is a never-ending job and the smallest relaxation of vigilance could result in a fresh outbreak of some health hazard to shellfish consumers. Beginning in the 1960's, there have been seven outbreaks of infectious hepatitis, affecting 867 people, associated with the consumption of shellfish harvested from polluted waters. Although the hepatitis virus is still to be isolated by the laboratory, recurrence of such outbreaks can be and is prevented through the effective application of program standards based on the use of indicator organisms.

Responsible Federal and State officials must continue to promote fundamental and applied research. FDA will obtain shellfish research support from three laboratories administered by the Environmental Control Administration. These facilities are located at Purdy, Wash., Dauphin Island, Ala., and Narragansett, R. I. In addition, research grants also will be available to qualified non-profit institutions with worthwhile study projects in shellfish sanitation problems. A total of 11 such grants totaling \$690,000 has been committed for the current (1969) fiscal year.

If conditions affecting our estuaries remained unchanged, the need for research and technical assistance to other Federal departments and State agencies would not be great. But the rate of man-induced degradation of our estuaries is alarming. Each time a ship channel is dredged, a new sewage treatment plant is constructed, a subdivision is made possible by filling a salt marsh, or a new industry locates near shellfish-growing areas, the possible changes these alterations may cause in the water quality must be evaluated. National Shellfish Sanitation participants are working with conservation groups, water pollution agencies, water resource planning agencies, and fishery groups to try to protect and preserve the remaining natural oyster beds and clam flats from pollution. Enhancement and restoration of some shellfish resources may be achieved through concerted

and cooperative efforts, but more rigorous pollution prevention and abatement action is needed to reverse the national trend of simply closing productive shellfish-growing areas subjected to hazardous pollution.

FDA will continue to provide the leadership and coordination necessary to focus attention on the needs of State agencies and will offer technical assistance and training programs for State and local health and conservation personnel. For assistance to State agencies in special studies, laboratory methods, consultation, and training, FDA has two Technical Service Units, one located at Dauphin Island, Ala., and the other at Davisville, R.I. Some current activities in these units include studies about the effectiveness of practices involving chlorination of sewage effluent, the fate of those bacteria of sanitary significance in estuaries, the effect of dumping sewage sludge at sea, ways to naturally purify polluted shellfish, and the design of cold water wash systems for chilling shellfish.

Periodically, members of the National Shellfish Sanitation Program meet at workshops to discuss proposed technical and administrative changes, new developments, and research findings. In recognition of the past history of the shellfish industry in the United States and of the relationship of the National Shellfish Sanitation Program to the effective use of this natural resource, the 1964 National Shellfish Sanitation Workshop endorsed the following principles:

1. Shellfish are a renewable, manageable natural resource of significant economic value to many coastal communities, and should be managed as carefully as other natural resources such as forests, water, and agricultural lands.

2. Shellfish culture and harvesting represents a beneficial use of water in the estuaries. This use should be recognized by State and Federal agencies in planning and carrying out pollution prevention and abatement programs and in comprehensive planning for the use of these areas.

3. The goals of the National Shellfish Sanitation Program are: (1) the continued safe use of this natural resource, and (2) active encouragement of water quality programs which will preserve all possible coastal areas for this beneficial use.

The more progressive oyster and clam fishermen are looking to the future for ways to effect better controls over the growing, harvesting, and processing of shellfish. Culturing methods that are being successfully used in Japan and some of the European countries on the Atlantic and the Mediterranean offer one way to avoid some of the calamities that beset shellfishermen who in this country rely mainly on Nature's vicissitudes to provide a sustaining crop year after year. Controlled cultivation and adoption of good conservation practices have provided the more resourceful U.S. shellfishermen with a dependable supply and uniform quality product.

In those countries that practice extensive artificial shellfish culture and scientific shellfish farming controlled breeding, selection of disease resistant strains, and close scrutiny from spat or juvenile stage to market size have produced desirable characteristics and made high-yield shellfish farming possible. These controlled methods allow harvesting of excellent market quality oysters within a year to 18 months after spawning. Because of site selection and preservation, these techniques offer relative freedom from

contamination by human diseases. The oysterman and the clammer in this country may be able to return to something of their former production levels by taking better advantage of such proved culturing methods.

We believe that the shellfish sanitation program of the United States, which is administered jointly by the States, the Food and Drug Administration, and the shellfish industry, has been highly successful in preventing transmission of disease through shellfish. We believe the program affords a challenging example of the achievements that are possible through cooperation of the State agencies, the Federal Government, and the affected industry. This general type of program will be continued by the FDA, subject only to those modifications necessary to meet changing conditions. Program improvements will be effected through increased research, development of better standards, assurance of adequate surveillance by State and FDA shellfish sanitation personnel, and through an increased awareness of the program objectives in shellfish receiving areas. FDA will make every effort to ensure and maintain consumer confidence in a safe and wholesome shellfish product.



## OCEANOGRAPHY

### New Ocean-Current Tracking System Tested Successfully

ESSA has tested successfully a new ocean-current tracking system that uses a satellite and a free-drifting buoy. This system also can provide satellite transmittal of oceanographic and atmospheric data collected by the drifting buoy. The test was conducted in the Gulf Stream by ESSA and NASA.

#### Test's Significance

The test represents the first successful attempt at tracking a free-drifting buoy in the deep ocean with satellite telemetry. M. E. Ringenbach, Acting Director, Engineering Development Laboratory, Rockville, Md., said: "The potential implication to the public and to the community of environmental scientists, as a result of the success of this experiment, cannot be overemphasized. Not only can ocean currents be traced accurately in this manner, but sensors on the drifting buoy can acquire oceanographic and atmospheric data, which can be transmitted with the navigational information. Through this technique, oceanographic and atmospheric data can be acquired from remote regions of the world."

#### The Test

In the test, a buoy equipped with Omega Position Location Equipment (OPL) was allowed to drift freely in the Gulf Stream off Florida's east coast. An Applications Technology Satellite (ATS-3) interrogated the buoy upon command. The buoy's navigational data were relayed through the satellite to the Goddard Space Flight Center at Greenbelt, Md., for processing.

The buoy was released about 15 miles off Miami, permitted to drift 24 hours, and recovered about 18 miles off West Palm Beach. It had traveled 66 nautical miles. During its course, it was tracked concurrently by an ESSA Coast and Geodetic Survey launch, by the 'Gulf Stream' (an oceanographic vessel operated by Nova University of Ft. Lauderdale, Fla.), and via satellite by NASA in Greenbelt, Md.

A drogue chute was attached to the buoy at a depth of 90 feet. As a result, the buoy's movement was affected primarily by ocean current, not by wind and waves.



### New Nautical Chart Issued for New England Coast

A new small-craft nautical chart covering New England's coastal waters from Boston, Mass., to Portsmouth, New Hampshire, has been published by ESSA's Coast and Geodetic Survey.

The accordion-folded chart (613-SC) is on a scale of 1:40,000. It is sufficiently detailed to provide safe and efficient navigation for a large part of the more than 100,000 small craft registered in Massachusetts and New Hampshire. The harbors of Boston, Portsmouth, Salem, Gloucester, Rockport, and Newburyport, all shown, support much commercial and recreational boat traffic.

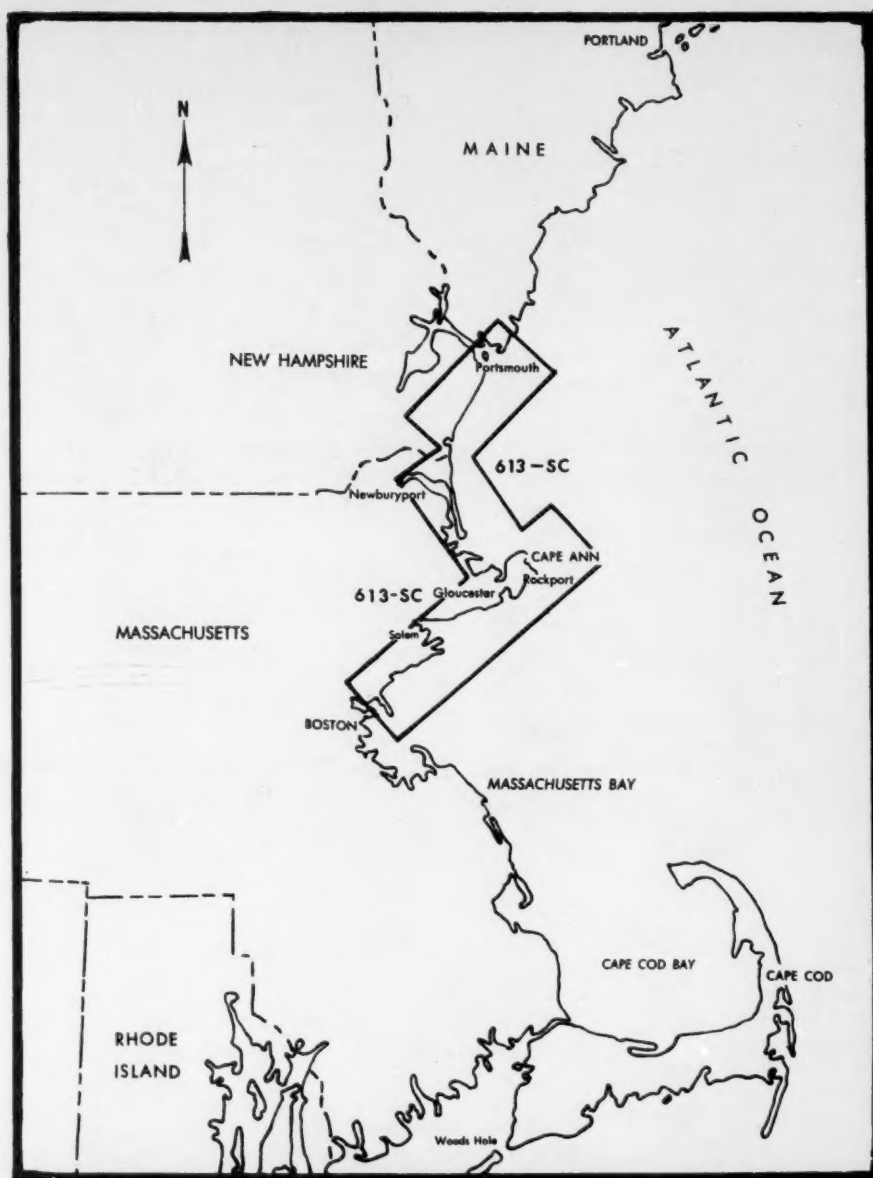
#### Fishermen's Favorite Area

Color and infrared photography taken by the Coast and Geodetic Survey in 1965 was used in the chart's development to depict the rocky coast and offshore features. Hydrographic information was updated from 1967 Coast and Geodetic Survey surveys near Cape Ann.

This section of the New England coast has been a favorite of sport and commercial fishermen since the days when whalers put to sea from the area. In 1967, commercial fishermen from Massachusetts and New Hampshire caught nearly 400 million pounds of fish and shellfish worth about 40 million dollars.

Chart 613-SC may be purchased for \$1.50 from Coast and Geodetic Survey agents, or from Coast and Geodetic Survey (C44), Rockville, Md. 20852.





Blocked area shows region covered by ESSA's new small-craft nautical chart (613-SC).

## New Bathymetric Map of Bering Sea, Alaska

A new ESSA bathymetric map of the bottom of the upper Bering Sea shows an extensive, relatively flat, basin about the size of Maryland and Vermont combined. An unusual feature of the 19,000-square-statute-mile basin is that it drains generally to the north toward the Arctic Ocean.

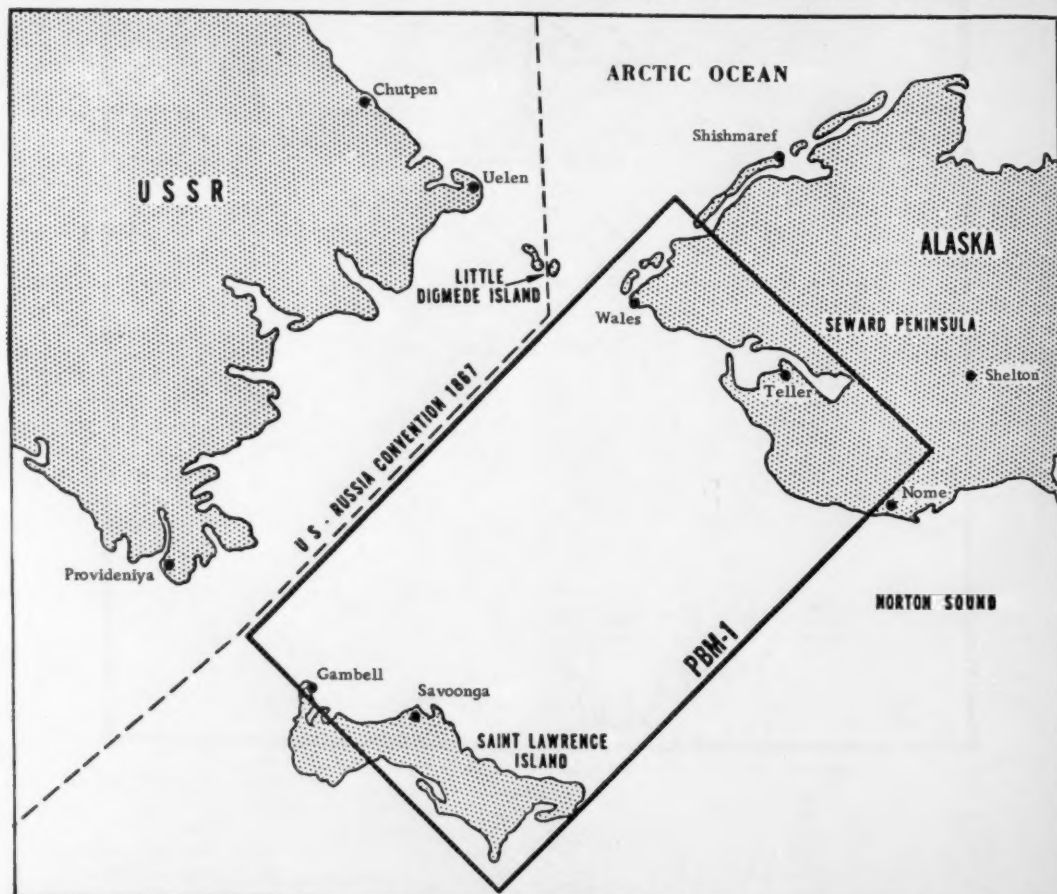
### The Area Covered

The map (PMB-1, scale 1:250,000) provides the most detailed bottom topography ever published for the area. The area is bounded

roughly by Seward Peninsula and Norton Sound to the east, Little Diomed Island to the north, St. Lawrence Island to the south and, on the west, by the U.S.-Russian Convention line, established in 1867 to separate the 2 jurisdictions. The sea floor adjacent to the Seward Peninsula and St. Lawrence Island is marked by numerous narrow ridges and basins.

### Map Is Preliminary

The map is a preliminary one. It will be replaced after new surveys have been completed. It is the first of the Continental Shelf series to include overlays showing geophysical displays of gravity and magnetics besides bathymetry. The geophysical overlays are expected to be available by September 1.



Seabottom of 19,000 square statute miles, equal to Maryland and Vermont, covered by ESSA's new bathymetric map. Unusual feature of the largely flat undersea basin is that it drains toward the Arctic Ocean.

## Chart Entrance to Alaska's Inland Waterway

ESSA's Coast and Geodetic Survey has published a new nautical chart (8080) for the entrance to Alaska's Inland Waterway. It provides the first detailed chart coverage for such major commercial waterways as George and Carroll Inlets, Thorne Arm, Revillagigedo Passage, and Nichols Passage.

The large-scale detail (1:40,000) displays the new aids to navigation, harbor improvements, and new topographic and hydrographic surveys conducted to 1965.

### To Aid Industries

It is believed the new chart will aid the fishing, lumbering, mining, and petroleum industries, which transport their products by sea.

Chart 8080 may be purchased for \$1 from Coast Survey Nautical Chart agents, or from Coast and Geodetic Survey (C44), Rockville, Md. 20852. (Chart on following page.)



## Fluke's Migrations Are Being Tracked

A cooperative effort to track the migrations of the fluke, or summer flounder, has been launched by the American Littoral Society (ALS) and the Sandy Hook Marine Laboratory, reports Graham Macmillan, Society vice president.

He said: "Marine biologists are concerned about the recent rapid decline in fluke catches. Our members are all volunteer fish taggers and I know they will respond to this study of fluke migration and growth rates."

L. A. Walford, director of the Sandy Hook Marine Laboratory, notes that commercial fluke catches from Massachusetts to Virginia dropped from 19 million pounds to 8.4 million pounds in the last 10 years. Sport-fishing catches also have declined.

At the Sandy Hook Marine Laboratory, tank studies on adult fluke are underway. Offshore expeditions have been sampling waters for spawning fluke and for fluke larvae and fry.

### Spawning Areas & Season

Marine biologists have found that fluke spawn in the fall in areas 10 to 30 miles offshore from Cape Cod, Mass., to Cape Lookout, N. C. When they are less than an inch long, they migrate into estuaries. There, they live for a year before venturing again into the open ocean. Some biologists believe juvenile fluke survive well only in southern waters--and that Long Island waters are supplied mostly by North Carolina fluke.

Much of this is theory, ALS states. But, it is a fact that in recent years no baby fluke have been reported from waters north of Chesapeake Bay.

### Urges Members' Help

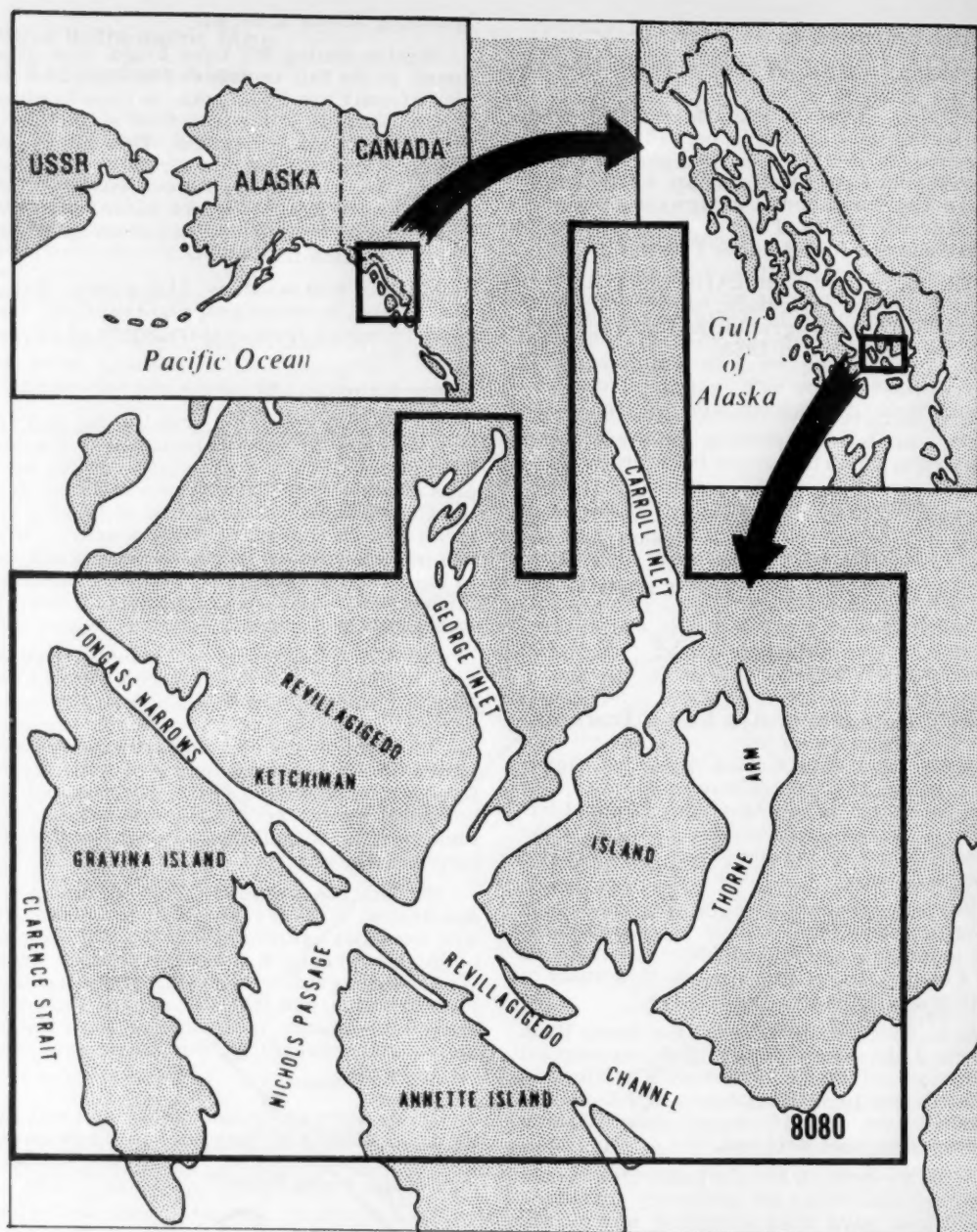
ALS members will be urged to tag and return as many fluke as possible over the next 2 summers. The members will collect samples of very small fluke in estuaries north of the Chesapeake. The results of tagging returns are published in ALS' journal. They are made available to marine biologists and to the Atlantic States Marine Fisheries Commission because of the Commission's interest in the status of coastal fisheries resources.

Since ALS' tagging program began 5 years ago, its members have ordered over 15,000 tags. These tags are the "spaghetti" type inserted through the fish's body behind the dorsal fin. While volunteer taggers have concentrated on striped bass, they also have tagged flounder, sailfish, tarpon, shark, bluefish, bonefish, grunt, spot, cod, croaker, tautog, tuna, bonita, dolphin, pike, smallmouth and largemouth bass, and muskie.

Macmillan notes: "Our members are sportsmen in every sense of the word and will be most interested in helping marine biologists preserve a species on the wane. We are asking fishermen to tag a fish that they love to catch and love to eat. We know that many will choose to tag and return some of their catch--hopefully, one for science, one for the pan."

Dr. Walford hopes that fishermen will tag the undersized fish they have to throw back. "We are especially interested in the wanderings of the young fluke."





Area covered by ESSA's new nautical chart 8080 for entrance to Alaska's Inland Waterway.

## Foreign Fishing Off U.S. in May 1969

### OFF ALASKA

**Soviet:** A sharp decline began in April and continued in May. Gulf of Alaska shrimp fishery ended, and the king crab and groundfish fleets withdrew from eastern Bering Sea. Nearly 80 vessels were sighted in early May; 21 remained at month's end (nearly twice as many as at end of May 1968).

Pacific ocean perch fishing along the Aleutians increased from 5 stern trawlers to 10 stern trawlers and 1 refrigerator, primarily in Samalga-Segum Passes region, in eastern and central Aleutians. However, at least 2 stern trawlers were fishing off the western Aleutians by late May. The western Gulf fishery declined rapidly--10 stern trawlers and 2 refrigerated fish carriers in first week, 2 stern trawlers by mid-month, and 1 stern trawler at end. Catches were poor, both in the Gulf and off Aleutians.

Five medium side trawlers and a refrigerator fished bottomfish along Continental Shelf edge in central Bering Sea through May. Two medium trawlers fishing west of the Pribilofs were joined by 2 stern trawlers in late May. Sablefish, Alaska pollock, arrowtooth flounder, and rockfish were trawled in depths down to 500 fathoms. A 20-vessel fleet that had shifted from flounder to pollock and sablefish, south of the Pribilofs, had shrunk to less than 10 by mid-month. It disbanded in a few days after shifting to fishing off the Alaska Peninsula.

Apparently king crab catches again were poor this year. The 2 tangle-net fleets withdrew in mid-May. In 1968, they had withdrawn by May 2, with a total catch of 22,442 cases. This year's catches are probably not much larger--far below the 52,000 case catch quota.

By mid-month, 2 fleets fishing shrimp east of Kodiak Island had joined a third in the western Gulf, east of the Shumagins. The Soviets said that catches east of Kodiak were not good and that they had been hampered by bad weather. Catches observed east of the Shumagins appeared to be good. All 3 fleets had withdrawn by late May, about the same time as in 1968.

**Japanese:** The arrival of part of the 1969 high-seas salmon fleets, and of herring fishing vessels off Bristol Bay and in Norton Sound, raised the number of vessels to over 300 by end of May.

The longstanding ocean perch fishery in the Gulf was at a low level; only 2-3 stern trawlers were fishing, primarily in the western Gulf. Perch fishing along the Aleutians was observed in early May. By month's end, 2 stern trawlers were intermingled with the Soviets' in the Samalga-Segum Passes region, and a third was near Amchitka Island.

About 10 stern trawlers, taking pollock, sablefish, arrowtooth flounder, and ocean perch, remained along the Shelf edge in eastern and central Bering Sea throughout month.

By mid-May, 2 more factoryship fleets had joined the minced meat and meal fishery in eastern Bering Sea, making a total of 5 factoryships and about 84 trawlers. During first half of month, all 5 fleets centered on the Continental Shelf, northwest of Unimak I. About mid-May, 2 shifted to the Shelf edge north of the eastern Aleutians.

Two to 3 longliners sought sablefish in the Gulf, one off southwest Kodiak Island, the others off southeast Alaska.

By mid-month, the 2 crab fleets had moved from outer Bristol Bay to east of Pribilofs. Unlike Soviets, they fished both tangle-nets and pots, and sought tanner rather than king crab. The 2 fleets are expected to continue until summer or early fall to achieve the quotas of 85,000 cases of king crab, and 16 million tanner crabs (principally frozen in sections).

The 11 factoryship fleets in the high-seas salmon fishery left Japan May 15. By end of May, 4 fleets (132 gill-net vessels) were located far south of western Aleutians.

In mid-May, at least 14 stern trawlers, 3 smaller trawlers, and 6 longliners fished herring south of Togiak Bay, in northern Bristol Bay. The longliners, and some stern trawlers, fished with surface drift gill-nets. A second gill-net fishery for herring, with at least 2 longliners, was sighted in Norton Sound. (Japan had conducted a similar fishery in same areas April-June 1968.)

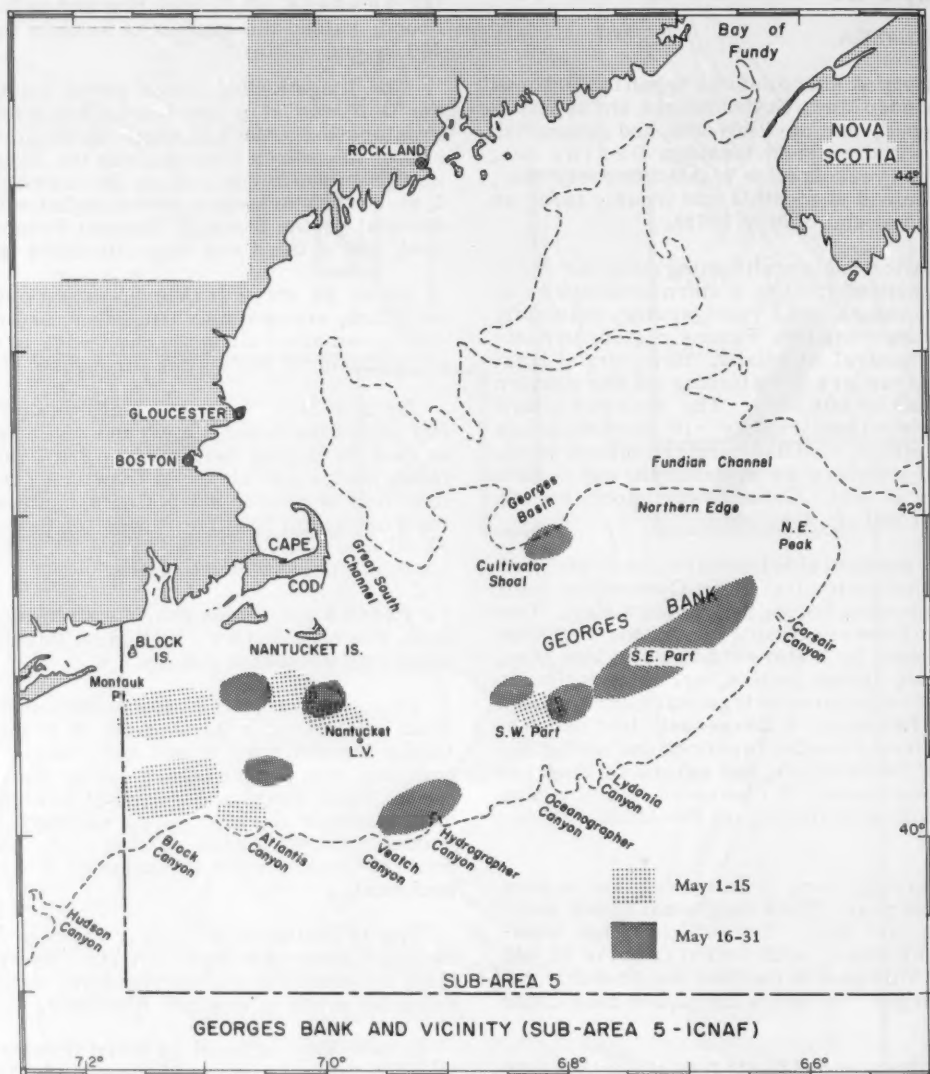


Fig. 1 - Principal New England waters fished by foreign vessels during May 1969.

South Korean: The lone factory trawler that had fished about a month along Shelf edge in eastern Bering Sea returned home by mid-May.

In early May, a second South Korean fishing operation--1 processing refrigerator and 5 small trawlers--appeared. This fleet was observed when it sought shelter in U.S. territorial waters on northwest Unimak I. It was reported nearly identical to a fleet that had fished unsuccessfully in 1967 and 1968; that fleet took very small catches of pollock. In late May, a second refrigerator and another trawler joined the fleet.

#### OFF PACIFIC NORTHWEST

Soviet: Twenty-eight stern trawlers, 15 side trawlers, and 12 support vessels were sighted. Most had come from off California. They fished almost entirely off Oregon, until last week of May, when 10 vessels moved north off Washington. Large catches of Pacific hake were observed. Some side trawlers had an estimated 20,000-30,000 pounds in their nets, and substantial quantities on the decks. A large single tow aboard one stern trawler was estimated at about 80,000 pounds. (In May 1968, 56 vessels had been sighted.)

Japanese: No fishing vessels were sighted during May. (Two stern trawlers and 2 support vessels had been reported in 1968.)

#### OFF CALIFORNIA

Soviet: On May 1, 12 stern trawlers were sighted fishing between Cape Mendocino and the Oregon border. One side trawler was southwest of San Francisco. On May 5, an observation flight failed to sight any vessels between Monterey and the Oregon border. (In May 1968, 8 Soviet vessels had fished off California.)

#### GULF OF MEXICO & SOUTH ATLANTIC

No foreign vessels were reported in May.

#### NORTHWEST ATLANTIC

For a third month, good weather afforded excellent surveillance of New England and Middle Atlantic coasts; 201 individual foreign fishing and support vessels were sighted--18% less than the 237 reported in April. (In May 1968, 207 vessels had been sighted.)

The Soviet fleets included 27 factory stern trawlers, 116 medium side trawlers (131 in April), 4 factory base ships, 1 refrigerated fish transport, 3 tankers, and 1 tug.

#### OFF SOUTHERN NEW ENGLAND & GEORGES BANK

Soviet: Throughout month, large groups of vessels were dispersed from south of Block Island, R.I., to eastern slopes of Georges Bank. Fishing in those areas increased early in May, when Soviet vessels gradually moved eastward from the mid-Atlantic off New York and New Jersey.

During first half of May, 90 vessels, mostly side trawlers, took herring and some mackerel in a 30-40 mile area, 50-60 miles south of Block Island. Smaller groups, about 50 vessels each (stern and side trawlers), were 24-40 miles south of Nantucket. Those 25 miles south were mostly stern trawlers fishing red hake. A group of stern trawlers has been fishing red hake in this general area since January 1969.

After mid-month, the main fleet shifted to south of Nantucket and the southwest part of Georges Bank. Catches were primarily herring. At month's end, the fleet was spread along eastern slopes (southwest and southeast parts) of Georges Bank, fishing in 30-40 fathoms. Catches were mostly herring. A sizable fleet, including about 20 stern trawlers, remained south of Nantucket fishing red hake.

Late in May, U.S. fishermen sighted about 100 foreign vessels, largely side trawlers, along southeast part of Georges Bank and Cultivator Shoals. The fishermen said 30-35 were seining herring with huge purse seines and power blocks. A BCF Agent, observing from a USCG cutter, May 27-29, reported 44 Soviet vessels fishing in 35-40 fathoms on northeast part of Georges Bank, 15 miles north of Corsair Canyon. About 35, mostly SRTR's, were rigged for purse seining. The gear was used off the starboard side. Seines were deep-water type. Two large power blocks were aft of the superstructure. Fish were brailled out of the seine by a long-handled dip net and lifted on deck. Catches were mostly herring, but fish on one vessel appeared to be pollock. At least 3 factory base ships and 2 refrigerated fish transports were heaped with barrels.

(During April 1968, at least 9 Soviet medium trawlers equipped for purse seining



Fig. 2 - Catamaran trawler 'Experiment.'

were sighted off Long Island, N. Y., and Block Island. Seven were actually seen seining for herring. In September 1968, the Soviets had indicated that purse seining off U.S. coast was exploratory, but that favorable results could lead to a more extensive fishery. Seining was described as a lower-cost operation than conventional trawling.)

The catamaran trawler 'Experiment' was sighted on May 27, about 55 miles south of Martha's Vineyard. The first of her kind, she was undergoing sea trials off New England. The 1,000-displacement-ton twin-hulled vessel, tested earlier in the Baltic, is said to have better maneuverability and stability than single hull trawlers. Each of Experiment's 2 hulls is shaped like a conventional SRT-300 medium side trawler, with 2 stern ramps and trawl decks for continuous fishing. She can be used for bottom and midwater trawling and purse seining.

Greek: During mid-May, the trawler 'Paros' was sighted on the Cultivator Shoals area of Georges Bank.

#### OFF SOUTHERN NEW ENGLAND & MIDATLANTIC COASTS

Soviet: About 30 vessels fished off New York and New Jersey, substantially fewer than the 100 sighted in April. The decrease was caused by an eastward shift of fishing operations to areas off southern New England and Georges Bank.

Early in May, 9 medium side trawlers were 55-60 miles south of Moriches Inlet, L. I. Large catches of herring and mackerel were observed on deck. Five factory stern trawlers fished 80 miles east of Cape May, N. J., but no catches were observed.

By mid-month, 27 vessels (mostly side trawlers) were in a 20-mile area 65 to 85

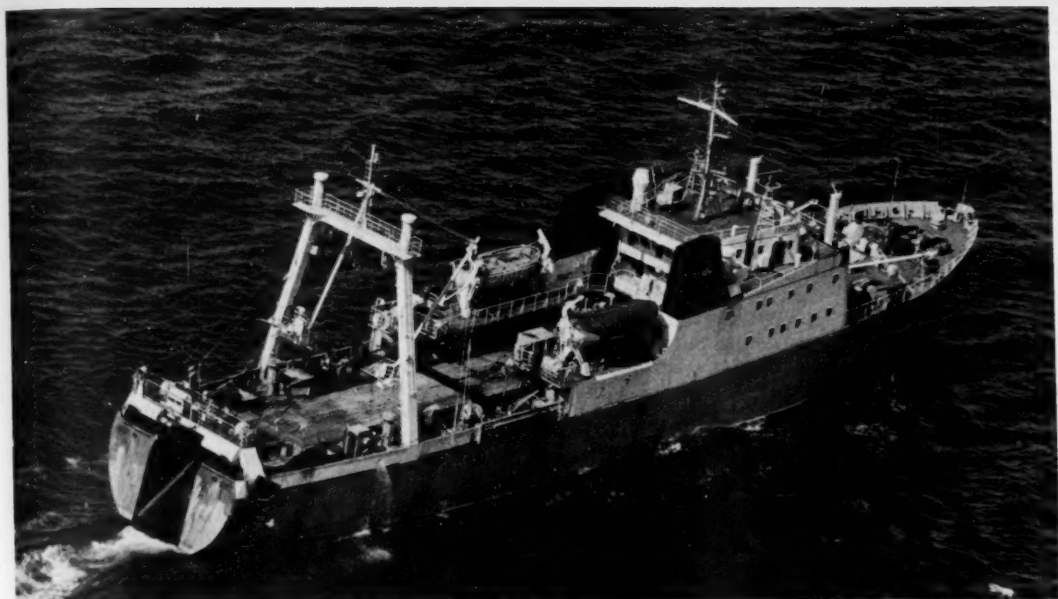


Fig. 3 - Cuban freezer stern trawler (Atlantik class) 'Playa Giron.' Sighted during May 1969 south of Block and Nantucket Islands. (Photos - C. Philbrook, BCF.)

miles east of Atlantic City, N. J., 10 to 30 miles southwest of Hudson Canyon. Limited catches appeared to be herring.

Polish: Three factory stern trawlers, 25 large sidetrawlers, 1 factory base ship, and 5 transport vessels were sighted.

During first half of month, 20-30 vessels shifted back and forth, from Long Island to south of Martha's Vineyard and Nantucket. Moderate catches were mostly herring, with some mackerel. From mid-month, 20 to 25 were dispersed from south of Nantucket to the eastern slopes of Georges Bank. Catches were mostly herring. (A year ago, 25 to 30 Polish vessels had fished off New York, New Jersey, and southern New England.)

East German: Three stern trawlers and 8 side trawlers fished among the Polish and Soviet fleets off southern New England. A few vessels were scattered off Long Island and, late in the month, along the eastern slopes of

Georges Bank. Catches were identified as herring.

Japanese: Early in May, 2 stern trawlers fished 85 miles south of Nantucket, and 65 miles south of Montauk Point, L. I. No catches were noted and no further sightings were made.

Cuban: One factory stern trawler, 'Playa Giron,' was sighted among other foreign vessels south of Nantucket. No catches were noted. This may be the first sustained Cuban fishery off New England.

Bulgarian: A stern factory trawler was sighted in early May fishing about 80 miles southeast of Cape May. In late May, she was about 60 miles south of Martha's Vineyard. This was the first sighting of a Bulgarian fishing vessel off U.S. coasts. Bulgarian sources have been predicting the beginning of this fishery for several years. No catches were observed, but it is believed she was seeking herring and mackerel.



## STATES

### Alaska

#### GOV. MILLER SIGNS 'COAST' COMMISSION BILL

Gov. Keith H. Miller of Alaska has signed legislation creating the Commission for Ocean Advancement through Science and Technology. He said: "With the COAST Commission established, we can proceed with development of a comprehensive coordinated State plan for the wise multiple use and conservation of our marine and coastal resources."

#### The Law

The law provides for a 10-member commission; 5 Alaskans experienced in oceanographic resources and problems, and 5 non-State members. The Commission is charged to begin a comprehensive study of the marine sciences and the marine and coastal environment in and near the State.

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#### BCF METHOD SPURS KODIAK'S SEAFOOD WASTE MANAGEMENT

Kodiak plans to ask the Federal Water Pollution Control Administration for a demonstration grant to apply the process for shellfish waste utilization developed by Food Chemical and Research Laboratories under BCF contract. This decision followed meetings coordinated by BCF's Ketchikan Technological Laboratory staff. It culminated in a State-sponsored public meeting in Kodiak on May 21 to discuss harbor pollution.

#### Plant & Process

A plant would be designed to handle over 80 million pounds of waste now being dumped into Kodiak's harbor each year. The plant would cost more than one million dollars. It would operate by 1971.

The process separates the waste material into 3 products: (1) a high-quality protein concentrate, (2) a calcium chloride brine, and (3) chitin for marketing as valuable separate products.

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### PAN ALASKA ORDERS 5 MULTIPURPOSE VESSELS

Pan Alaska Fisheries, Inc., has ordered 5 multipurpose king-crab fishing vessels totaling about \$1,800,000. It is the largest single order ever placed in the king-crab industry. The 93-foot steel-hulled ships are to be owned and operated by the firm.

#### Capabilities of Vessels

The new vessels are designed to be fully adaptable to the other types of fishing in Northern waters. Besides their king crab capabilities, the sea-water-tanked vessels can be used for scalloping, and in other trawling for bottom fish and shrimp.



### Oregon

#### TUNA SCOUTS SAIL ABOARD 'SUNRISE'

The Oregon Fish Commission's tuna scouts sailed from Astoria June 28 aboard the chartered vessel 'Sunrise' on their annual 800-mile search for early arriving albacore tuna off Oregon's coast. The researchers will monitor oceanographic conditions and test-fish for tuna 30 to 120 miles offshore on the cruise down the Oregon coast to the California border.

Daily radio contact with the commission's Astoria research laboratory will advise researchers and fishermen of ocean conditions and the location of albacore concentrations. This information will be relayed to Oregon tuna fishermen, Oregon State University Marine Science Center, and to BCF, La Jolla, Calif., headquarters for news dissemination to the entire Pacific tuna fleet.

#### Warm Water Important

The abundance of the elusive albacore off Oregon is related directly to the presence of warm water. Fish Commission biologists are encouraged about Oregon albacore fishing prospects this year because of water temperatures. Through June 15, these were comparable to those through that date last year,

when landings set a record of almost 38 million pounds.

Larry Hreha, Astoria-based biologist in charge of the tuna exploration, believes Oregon will have another good season in 1969--at least about 20 million pounds or more. Through June 23, he reported, there were no known tuna catches in California waters. This was a fairly good indication the fish will be found off Oregon again this season.

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#### RECORD SALMON RUN TO FLOOD-CONTROL RESERVOIR

More than 4,000 adult spring chinook have returned to Fall Creek Dam from a 1966 release of 1.1 million unfed fry, the Oregon Fish Commission has disclosed. It was Oregon's most successful attempt to introduce and rear salmon in a flood-control reservoir.

The project on Fall Creek was completed by the U.S. Army Corps of Engineers in 1965. It has upstream and downstream migrant collection facilities. Rough fish in the stream were eradicated before it was filled. Then, early in 1966, 1.1 million spring chinook fry surplus to the Fish Commission's Willamette hatchery were planted in Fall Creek above the dam. They reared that summer in the reservoir and reached an average of 7 inches before emigrating during December 1966 and January 1967.

#### Survival Exceeds Commission's Hopes

The collection facility was monitored, but the exact number of juveniles that migrated from the reservoir is not known because many escaped through the dam's regulating outlet and could not be counted. However, the spectacular return shows that survival far exceeded the commission's hopes.

It was difficult to get young fish into the dam's collection "horns" or exits, but the Engineers' procedure of drawing the reservoir down for the anticipated spring run-off helped. Again this past year, the Fish Commission asked the Corps to evacuate the reservoir completely to aid juvenile emigration and to flush out predators above the dam.

#### The Return

On returning, the 4,000-plus adults, all 4-year-olds, enter a short fish ladder leading

into a trap. The collected salmon, along with other species, are then put into an "anesthetic tank." Rough fish are thrown away and the game species are hauled to a destination above the dam by Corps personnel.

Plants have been made each year since the first in 1966. In 1970, even more can be expected back because both 4- and 5-year-old fish will be returning.

The Fish Commission says this return is an example of the tremendous potential in reservoir-rearing of fish. Its earlier studies revealed excellent growth and survival of juvenile salmon in reservoirs when there were few predators. The commission adds that this does not necessarily mean all dams are good for fishery resources; on the contrary, many problems at dams are unsolved. However, certain impoundments may have considerable potential to enhance a fishery if they are constructed and operated so the young downstream migrants are able to emigrate.

#### Juvenile Fish

Most attempts at juvenile salmonid passage so far have been unsuccessful because of inadequate collection systems, especially at high dams. Also, at the high dams, there often is no spill and the juvenile fish may not "sound" or go down to enter the low-level entrance of the turbines. So, in the past, runs affected by such structures either have been forfeited or transferred to a hatchery.

Recent commission studies have confirmed that some nonpower-producing flood-control projects might be used to rear salmon without provisions for expensive and complex collection facilities for juvenile fish. One method of passing salmon smolts at these projects can be accomplished by evacuating a reservoir to the level of the stream bed each winter; this is now being done at Fall Creek reservoir.

The Fall Creek study is only one of 7 begun in the mid-50s to evaluate fish passage and fish behavior at public and private projects. The study is guided by a steering committee representing the Corps of Engineers, Oregon Game Commission, the Oregon Fish Commission, BCF, and the Bureau of Sport Fisheries and Wildlife.

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## LAST PART OF WILLAMETTE FALLS FISH LADDER BEING BUILT

Construction began June 26 on the third and final phase of the \$4-million fishway at Oregon City's Willamette Falls, reported Ed Neubauer, Director of Engineering for the Oregon Fish Commission. The fishway is funded by BCF (partly by Portland General Electric).

The construction of a 750-lineal-foot ladder and 2 more fishway entrances will greatly improve fish-passage conditions. Also, the perennial "wet hole" problem will be resolved. By filling and capping this pothole, a notorious salmon death-trap on the falls' east side will be eliminated. The naturally occurring holes create a problem each year as the spring flows recede. Previous efforts to remove the stranded fish alive were unsuccessful.

### Salvaging Fish

To salvage the fish, commission biologists are gillnetting the wet hole day and night. Carcasses are given to Clackamas County for use in its institutional food program.

Spring chinook escapement above the falls was good this year. The commission's Willamette River hatcheries already have enough returnees to satisfy their artificial-propagation needs.



## Maine

### MECHANIZED SARDINE-PROCESSING EQUIPMENT TO BE TESTED

Mechanized sardine-processing equipment from Stavanger, Norway, will be tested by the Maine Sardine Council in an attempt to improve and modernize the entire Maine sardine industry. The machinery will be installed in a canning plant at Prospect Harbor.

### Goal of Production Test

The Council's Executive Secretary, Richard E. Reed, explained the project. The primary goal is to deliver uniform-size fish speedily and efficiently--with heads and tails removed--to the women who place them in the cans. This would loosen a time-consuming and costly production bottleneck.

He said the Council decision to obtain sufficient equipment for a full-scale commercial production line resulted from promising pilot tests made last year. The tests indicated that production can be increased as much as 100% with uniform pre-cut fish. Also the work will be much pleasanter and easier. Traditionally, the cutting is done with hand-held scissors.

### Production Line

The production line will consist of a fish sorter or size grader. Three automatic devices will orient and head the fish in one direction and feed them into a high-speed cutter. The cutter also cleans.

The equipment is being leased by the Council. All results will be made available to industry. Reed said this automatic processing machinery is not manufactured in the U.S.



## Florida

### UNIVERSITY PLANTS 'ARTIFICIAL SEA GRASS'

Some 'artificial sea grass' was scheduled to be laid down along the Gulf bottom in July by Florida State University oceanographers. They are trying to provide a habitat for such valuable shellfish as scallops and shrimp.

Dr. R. W. Menzel, a biologist in the Oceanography Department, said that if the experimental plantings were successful they could show the way toward replacing the coast's natural habitats destroyed through dredging and filling. There, natural grass cannot be started again.

"But we don't know whether it will work," Menzel added. "Barnacles may attach themselves to the blades of grass and weight them down so that the grass doesn't wave like ordinary sea grass."

### 3 Areas

The ribbon-like, 18-inch long, strands of artificial grass have been attached to pieces of wire fencing. These will be put in 3 locations, each a 30-square-yard area.

One location will be in a dredged area along the channel leading from the marine lab harbor. Another will be in bare areas near where

natural grass is growing. A third will be on a bottom where no grass has grown before.

Productivity of the artificial grass areas will be compared with natural-grass-bottom productivity.



## California

### FEEES VIRTUALLY PAY FOR FISH & WILDLIFE CONSERVATION

The California Department of Fish and Game reported on July 5 that Director Ray Arnett had told Gov. Reagan: "There are some 755,000 licensed hunters and 2,250,000 licensed fishermen in California, and that their license, tag and stamp purchases pay virtually the entire bill for fish and wildlife conservation activities in the State. The remainder of the funds come from fines for fish and game violations, commercial fish taxes and federal aid money from the federal excise taxes on the sale of fishing tackle and sporting arms and ammunition. The Department of Fish and Game does not receive any General Fund money for its operations."

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### COMMERCIAL LANDINGS & TUNA SHIPMENTS DECLINED IN 1968

California's Department of Fish and Game has provided this report on State fisheries:

"California's commercial fish landings and tuna shipments totaled 567 million pounds in 1968, a decrease of 22 million pounds from the previous year. A 59 million pound decrease in the landings was partially compensated for by a 37 million pound increase in tuna shipments.

"Landings amounted to 445 million pounds, a decrease of 12 percent from 1967. The major factors in this decline were the drop in skipjack tuna landings and the absence of a substantial anchovy fishery early in the year.

"As in 1967, yellowfin and skipjack tuna were the first and second ranked species, together making up almost half of the catch. Jack mackerel was third ranked and anchovy fourth, reversing their 1967 order. Squid replaced Pacific bonito as the fifth ranked species. The next five species, in order of importance, were market crab, albacore, Pacific bonito, bluefin tuna, and rockfish. The top ten species made up 88 percent of the total landings.

"The most significant change in the landings was the drop of 51.7 million pounds in skipjack tuna landings, almost erasing the gain made in 1967. The anchovy catch declined by 38.6 million pounds, reflecting poor economic conditions for the reduction fishery early in the year. Other major decreases were a 6.3 million pound drop in Pacific bonito landings and a 2.8 million pound decrease in albacore. Bigeye tuna landings were down by 1.0 million pounds, reflecting a change in reporting procedures.

"The most important gain was made by jack mackerel; landings increased by 17.5 million pounds as fishing effort increased. Yellowfin tuna landings increased by 12.7 million pounds even though international controls limited the take. Squid landings jumped by 27 percent because of good market demand, and reached the highest level since 1946. Market crab landings were up by 4.3 million pounds, reflecting a record season in the Eureka area. Pacific mackerel landings rose by 2.0 million pounds to show a very slight recovery from the all time low recorded last year. Dover sole also showed a significant gain with landings increasing by 1.3 million pounds.

"Tuna shipments increased to 122 million pounds, a 43 percent increase from the low level recorded in 1967."



## FISHERY OCEANOGRAPHY

Felix Favorite

This is the first of a series by Dr. Favorite who, for over a decade, has been in charge of an oceanographic program to define the ocean environment of the Pacific salmon (genus *Oncorhynchus*). The purpose of the series is to show how oceanographic research can aid in locating areas of profitable fishing and in solving problems of fishery research.

The meteoric rise in popularity and funding of oceanographic research in the United States has caught most fishery biologists by surprise. Funds for biological studies have increased somewhat proportionately to those of other fields, but little effort has been made to influence oceanographers outside the agency concerned to conduct research directly related to fishery problems--except perhaps for the efforts of the Eastern Pacific Oceanic Conference. Nevertheless, in most national oceanographic programs, it is clearly stated that the research to be conducted will benefit the fisheries. Several years ago, while participating in a U.S.-USSR Oceanographic Exchange Program, I discovered that Soviet oceanographers also claimed that their research was beneficial to fisheries; however, fishery groups were somewhat skeptical about the extent to which it really aided their operations.

## The Ocean Is Many Things

To the oceanographer, the ocean is a number of things: a three-dimensional, stratified fluid, on a rotating earth, subject to a variety of internal and external forces; a vast reservoir of heat which has a great influence upon the earth's weather and climate; a sink for excess CO<sub>2</sub> spewed into the air by modern industry and for dissolved and particulate fractions of the earth carried into the sea by river runoff; a medium for transportation of people and things, subject to destructive waves and storms; a reservoir of vast mineral wealth; and a highly complex biological environment.

Dr. Favorite is an Oceanographer with BCF Biological Laboratory, 2725 Montlake Boulevard East, Seattle, Washington 98102.

The environment includes an intricate food cycle that starts with chemical nutrients and specific physical conditions and advances from microscopic unicellular plants to macroscopic herbivores (or plant-eating plankton) and then to carnivorous plankton (which is the prey of small and large fishes, and whales). Thus, fisheries are only a small portion of the spectrum of interest to the oceanographer. To the marine fishery biologist, also, oceanography is only one aspect of the total life history of fishes. But the oceanographer believes that all oceanographic research has some bearing on fishery research, even though specific relations are not sought by him; for his part, the fishery biologist often believes that it is too early to consider seriously the effects of the ocean environment until more research is accomplished in physiology, behavior, distribution, and mortality of fishes.

## Fishery Oceanography

Man has always considered the environment to have an effect on fish. The use of surface temperatures on the Grand Banks is an excellent example that goes back several centuries. But it has been only during the last decade or two that a small group of dedicated people--known as fishery oceanographers--has tried to merge the fields of fisheries and oceanography. The term 'fishery oceanography' is purported to stem from 'fishery hydrography', which was coined at the beginning of this century. 'Fishery oceanography' is not only relatively new, but it is almost impossible to define--as witness the

U.S. DEPARTMENT OF THE INTERIOR  
Fish and Wildlife Service  
Sep. No. 843

variety of about 100 opinions obtained by Dr. W. M. Chapman<sup>1</sup> from leaders in marine science.

Perhaps the most-pertinent definition originates with Dr. O. E. Sette, Director of the BCF Ocean Research Laboratory and Chairman of the Eastern Pacific Oceanic Conference:

"Fishery oceanography is the study of living resources of the sea and of natural phenomena directly or indirectly influencing them in a manner potentially or actually significant to their use by man, including any information gathering needed for such studies."

This definition includes two aspects: the first is basically fishery biology; the second, the study of natural phenomena, is oceanography. It is expertise in this field that the oceanographer brings to fishery research to expand our understanding of the distribution, behavior, and abundance of fish. It is this phase of fishery oceanography that will be discussed in the series of articles.

More often than not, it is the physical oceanographer, rather than the biological or chemical oceanographer, who expands the horizon of the fishery biologist. This is because the biologist has already received extensive training in chemistry and biology. Someone has coined an apt phrase, fish-ical, rather than physical oceanographer. In some respects it is a good one. To be effective, this person must not confound his cohorts with rigorous hydrodynamical solutions--but bridge the gap between the two fields. Chemical and biological oceanography, however, are inextricably interwoven with the physical aspects; all must be considered in solving problems in fishery oceanography. For example, fish will not usually be in an area of ideal physical conditions if the water is polluted, or if there are no food organisms. Nevertheless, "fishery oceanographer" is not a particularly popular title because those that deviate from the pure-science aspects of their field are not looked upon favorably by their peers. This is perhaps particularly true in Japan, where a great deal of fishery oceanography is accomplished.

#### Progress Has Been Slow

Progress in fishery oceanography has been painfully slow. The fishery oceanographer

is often forced to work without the extensive facilities that are available aboard a vessel designed exclusively for oceanographic research. Usually, he must share vessel time with the fishery biologist, who has a specific assignment to obtain a certain amount of data on fish catch regardless of the environmental conditions. The fishery oceanographer would like to change these circumstances. Unless one knows the environmental conditions under which the catch was made, the information does not contribute much to our knowledge of locations of profitable pelagic fishing. One might as well indicate the fishing location with an X on the water fished as on a chart, because it would be impossible to find that spot again. Of course, this shortcoming does not apply specifically to groundfish, because their distribution may be directly related to bottom topography. Nevertheless, most groundfish perform spawning and seasonal migrations that are probably triggered by environmental conditions; so the same statement can apply.

Progress will be slow as long as the fishery oceanographer is limited to taking observations along a predetermined or arbitrary fishing track, or only at fishing stations. It is important to know conditions in the general vicinity of the fishing location. Rather than striving for an equitable division of time aboard a single ship, it would be best to have two ships working together, one observing environmental conditions before and during fishing operations. Actually, both vessels should be capable of either phase of operation. I have not witnessed the routine used during Soviet fishing operations, but I was informed that areas of 80 by 120 miles were blocked out for fishery investigations. At times, 4 or 5 of the 10 vessels in an area of this size made extensive environmental observations during their fishing. This comparative effort could be considered fishery oceanography in the real sense of the term; the oceanographers involved in these studies are attached to the fishery institutes. The general large-scale oceanographic investigation that provides the background for selecting general fishing areas should continue. More effort, however, should be expended on small-scale investigations at the time of fishing.

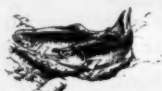
#### The Pacific Salmon

If one is attempting to ascertain relations between fish and ocean conditions, perhaps

<sup>1</sup>Comments on 'Fishery Oceanography,' Vols. I-III. Prepared for working party on Fishery Oceanography of Scientific Committee on Oceanic Research, International Council of Scientific Unions, 1962.

one of the most rewarding to study is the Pacific salmon. Like the Atlantic salmon (*Salmo salar*), the Pacific salmon are anadromous: they spawn in fresh water and, after a residence in fresh or brackish water (depending on species), they migrate downstream and far out into the ocean. There they grow and mature during a 1- to 3-year residence before returning to fresh water to complete the life cycle. But, unlike Atlantic salmon, Pacific salmon die after spawning. Only young salmon, or fry, make up the downstream migrants.

It is not too difficult to obtain an estimate of the progeny from major river systems. Furthermore, it is fairly well documented that most will return to parent streams. Some stocks can be identified by chemical and biological techniques, as well as by tagging methods. Studies on the ocean environment of these salmon have been made at the BCF Biological Laboratory over the past decade in conjunction with exploratory fishing in the Pacific Ocean. Some results of these studies will be the subject of future articles.



#### WHAT CAUSES HURRICANES AND HOW DO THEY DIFFER FROM TYPHOONS?

Hurricanes are great heat engines, much like the gasoline engine in a car. The moisture in the humid air over the sea is analogous to the gasoline in the gas tank; it contains the potential energy (or fuel) for the hurricane. Once the hurricane is born, it draws moist air up from the sea surface in a counterclockwise spiral to the condensation level. Here cooling of the air, due to reduced pressure, condenses water vapor in the air. This can be equated to the combustion cycle in the gasoline engine; it converts potential energy to kinetic energy.

The latent heat of condensation (597 calories per gram of water) heats the air, which then accelerates in its upward spiralling journey. It literally goes "up the chimney" formed by the relatively cooler air around it. At the top of the chimney of cooler air, the warm air spreads outward in a clockwise spiral (when viewed from above). As air spirals upward, through and out of the chimney, it draws more warm, moist air into it from below. This self-perpetuating process intensifies the circulation, causing the engine to run faster and causes the hurricane to increase in size.

The exact mechanism of hurricane formation is still unknown. Scientists know that very warm ocean water is required. The warmer the water, the greater will be the volume of moisture (potential energy) carried aloft. A storm must be some distance away from the Equator in order to start spinning, because the spin of an object on the earth varies directly with the sine of the latitude. There must be an outward (divergent) flow of air in the high atmosphere; otherwise the chimney would be closed off.

The origin of a hurricane is associated with an area where air converges and showers occur. This may be a remnant of low pressure from a cold front which moved far south; it may be an area of lower pressure moving westward in the Trade Wind Belt (easterly wave); or it may be an area where air from the two hemispheres converges (intertropical convergence zone). The origin could be due to oscillation of the great high pressure system which dominates the ocean.

Hurricanes and typhoons are alike in origin, structure, and features, their only difference being the area of the world in which they occur. Hurricanes occur in the waters adjacent to North America (North Atlantic Ocean, Gulf of Mexico, Caribbean Sea, and Southeastern North Pacific Ocean); typhoons occur in the Western North Pacific Ocean. Because of the vast expanse of warm water in the Western Pacific, typhoons occur more often than hurricanes and are frequently larger and more intense. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

# SEARCHING FOR TUNA

Thomas Potthoff

As part of the cooperation that exists between the Atlantic Oceanographic Laboratories of ESSA and the Tropical Atlantic Biological Laboratory of BCF (both in Miami, Fla.), I participated in the Atlantic Tradewind Expedition (ATEX) as an observer. The purpose of ATEX was to study oceanographic and atmospheric conditions in the central tropical Atlantic. This expedition was undertaken by three nations in February 1969: W. Germany furnished the two research vessels 'Planet' and 'Meteor'; Great Britain used the 'Hydra'; and the United States assigned the Coast and Geodetic Survey ship 'Discoverer'.

The four ships took up positions in the mid-tropical Atlantic at the beginning of February on the corners and at the center of a triangle, each side of which was about 350 miles long, and then drifted for 2½ weeks, instead of occupying oceanographic stations along a planned cruise track.

Research at the Tropical Atlantic Biological Laboratory (TABL) centers on the biology of commercially important tunas in the tropical Atlantic Ocean. Research cruises over the past several years have produced large volumes of data from various sections of the tropical Atlantic, but biological investigations in the central tropical Atlantic--the area covered by ATEX--have been virtually nonexistent. TABL therefore welcomed the opportunity for one of its biologists to be present aboard the Discoverer during the expedition. Knowledge of the presence or absence of larval, juvenile, and adult tunas in the region could be important to an understanding of the life cycle of tunas and, conceivably, might help commercial fishermen in their quest for new fishing grounds. Collections made on ATEX of marine life other than tunas might also be valuable as indicators of the kinds of prey organisms that are available in the central Atlantic to large pelagic fishes, particularly the tunas. My objectives as an observer on the Discoverer were to collect small tunas and other organisms by dipnet under a night light, to collect larval

tunas and other zooplankton by 1-meter net tows, and to observe and make records of schools of tuna and other large fishes.

On February 5, 1969, when the Discoverer occupied a position at 13° N. 39° W., a platform and an 800-watt light were rigged on the downwind side of the vessel. Part of each of the next 18 nights was spent dipnetting from the platform. Each midnight a plankton tow was made. The ship's rate of drift varied from 1.0 to 1.7 knots, which was slow enough to allow us to observe gradual changes in the composition of marine animals over a considerable distance.

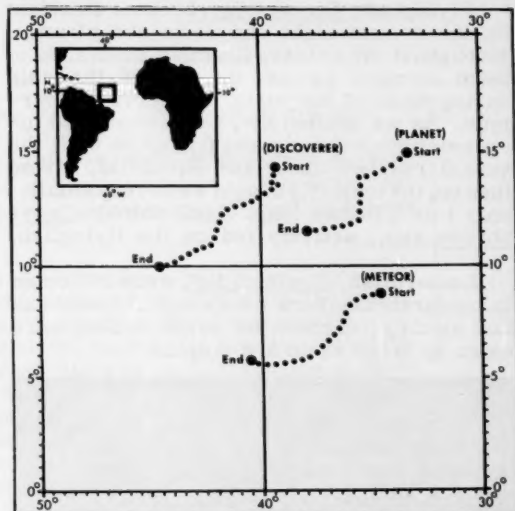


Fig. 1 - Drift tracks during the Atlantic Tradewind Expedition (ATEX), February 1969. The small square on the inset map (upper left) delineates the area shown in the figure. No trackline was available for the R/V Hydra.

During the first two nights, great numbers of the blanket octopus, *Tremoctopus violaceus* (rare in museum collections), were seen and caught. Fewer were netted during the third and fourth nights and, by the fifth night (at 12° N. 40° W.), they had completely disappeared. Specimens were up to 1½ inches long; males of this size were adult, but females

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U.S. DEPARTMENT OF THE INTERIOR  
Fish and Wildlife Service  
Sep. No. 844

were juvenile. (Dr. Gilbert L. Voss, personal communication, Institute of Marine Sciences, University of Miami, reported that the adult female of the blanket octopus reaches a length of 3 to 5 feet.)



Fig. 2 - The R/V Discoverer on ATEX.

Flyingfish, *Exocoetidae*, became abundant on the second night and remained plentiful throughout the cruise; literally thousands of them thumped against the hull of the ship during some of the nightly observation periods. As we drifted SW, we encountered increasing numbers of young flyingfish until the vessel reached about  $10^{\circ}$  N.  $43^{\circ}$  W. From then on, the majority caught were very small—only 1 or 2 inches long. Adult dolphin *Coryphaena* spp., actively fed on the flyingfish.

Lanternfish, *Myctophidae*, were collected in moderate numbers every night. Almost as fast as they reached the surface, they were eaten by large squid and dolphin.



Fig. 3 - Night lighting. Dolphins feeding on organisms attracted to the light.

Small juvenile dolphin were caught around the light in good numbers but were apparently less abundant than the large adult ones. The numbers of adult dolphin milling about the ship increased each night until, at the end of the drift period, they were visible in a wide area all around the ship. We estimated at least one fish for every square yard of sea surface. In the daytime the dolphin scattered and few were observed. Many of the adult dolphin caught on fishing tackle by the crew averaged 5 to 10 pounds and some exceptionally large ones weighed 40 pounds. Sharks of 10 to 15 feet were seen often. Most were whitetip sharks, *Carcharhinus longimanus*, which were occasionally accompanied by rainbow runners, *Elagatis bipinnulatus*. Other species were caught under the light, but in smaller numbers than flyingfish, octopi, dolphin, and lanternfish. A number of squid were captured also. Several times the ship drifted into large patches of salps that luminesced when touched. Sometimes the area on the windward side of the ship was lit up by the salps as the vessel touched and drifted over them.

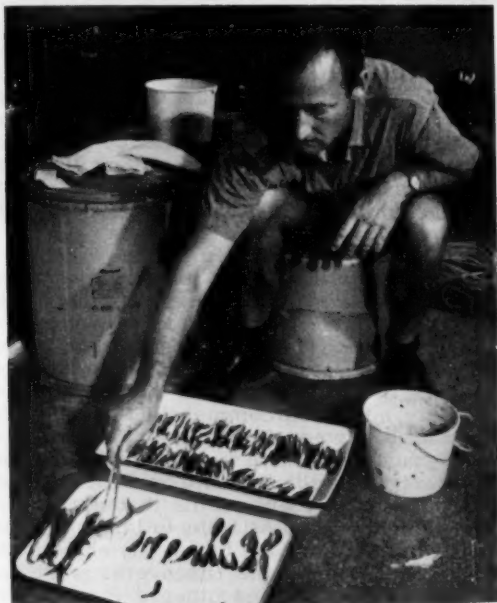


Fig. 4 - Sorting night's catch aboard R/V Discoverer.

On February 22, the drift period ended at  $10^{\circ}$  N.  $44^{\circ}$  W. The vessel had drifted about 360 nautical miles.

The biological observations made during the cruise in this poorly known mid-Atlantic area may be summed up as follows:

1. Not a single school of tuna was sighted and no juvenile tuna were collected, although the chances of finding tuna appeared favorable on the basis of the temperature (25-27°C.) and the presence of organisms suitable for tuna food.

2. Dolphin, the only large pelagic fish present in large concentrations, fed heavily on flyingfish. To my knowledge, this is the first report of concentrations of dolphin in the mid-Atlantic.

3. Study of the plankton tows made during this voyage (now in progress at TABL) has so far revealed the presence of a few skipjack tuna larvae. When all samples have finally been studied, better conclusions may be drawn as to the presence or absence of tunas in the tropical mid-Atlantic.

4. The many large concentrations of flyingfish, lanternfish, octopi, and salps observed, and the other organisms seen or collected, suggest an abundance of forage organisms suitable for tuna, marlin, and other large pelagic fishes.



#### WHAT UNIVERSITIES AND COLLEGES HAVE OCEANOGRAPHIC COURSES?

Before World War II, only two universities in the United States granted degrees in oceanography. By 1966, at least 50 colleges and universities were granting degrees in oceanography, marine biology, and ocean engineering; at least 20 others offered courses.

Because oceanographic facilities and ships are expensive, most institutions offer a broad training program covering the basic sciences, mathematical sciences, and some introductory environmental courses. Normally, the oceanographic curriculum is available to those who have completed the bachelor's degree. Specialization in marine biology and marine geology is available to undergraduates at some schools. In June 1966, the Sea Grant College Act, first suggested by Dean Athelstan Spilhaus, now President of the Franklin Institute in Philadelphia, and introduced into Congress by Senator Claiborne Pell (Rhode Island), was passed. This project to develop and support universities in much the same fashion as land grant colleges is being administered by the National Science Foundation.

A student interested in becoming an oceanographer should first major in one (or more) of the basic sciences--physics, biology, geology, chemistry, or meteorology. His later study of the ocean will relate to his past major. Most institutions offering degrees in oceanography require a bachelor's degree as a prerequisite. Oceanographers are expected to have mathematics through calculus.

Individuals planning to become oceanographers should begin preparation in high school; courses should include the sciences, mathematics, and a foreign language if possible. The best training for oceanography is to get into the "toughest" undergraduate science curriculum possible and to work hard.

Single copies of a list of colleges and universities offering degrees in oceanography may be obtained without cost from the National Oceanography Association, Suite 301, 1900 L Street, N.W., Washington, D. C. 20036. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

# ECONOMIC EFFECTS OF REGULATIONS IN MARYLAND OYSTER FISHERY

Richard E. Suttor and Thomas D. Corrigan

Among the many species of shellfish harvested commercially in Maryland, the oyster is the most important by far. It accounts for over half the total value of the State's seafood landings. However, the oyster industry is not what it used to be.

## Depletion and Repletion

In the late nineteenth century, Maryland oyster harvests exceeding 70 million pounds per year were recorded (Table 1). These large harvests were far greater than the maximum sustainable yield of the resource;

the depletion of the oyster beds during this period signalled the long-term decline of the fishery. During the first quarter of the twentieth century, oyster landings decreased rapidly--but stabilized later with harvests usually ranging from 10 to 20 million pounds during the next 30 years. Annual landings declined during the late 1950s and early 1960s to an all-time low of less than 8 million pounds in 1963.

To revitalize the industry, the State began an oyster repletion program in 1961. Oyster shells are dredged from nonproducing areas of the Chesapeake Bay and distributed on public oyster bars to provide "cultch" on which the oyster spat can attach and grow. The State also transplants seed oysters from nursery areas to growing areas, where the mature oysters are later harvested. In recent years, over one million bushels have been transplanted annually (table 2). As a consequence, the industry has recovered somewhat during the past few years; the 1967 harvest was over 16 million pounds, nearly double the 1965 landings. Maryland has now regained its position as the leading oyster-producing state.

Year	Catch	Year	Catch
	1,000 Lbs.		1,000 Lbs.
1880	71,868	1944	14,127
1888	57,845	1945	15,034
1890	70,852	1946	13,590
1891	67,428	1947	13,077
1897	49,189	1948	13,285
1901	38,548	1949	13,718
1904	29,333	1950	14,406
1908	39,527	1951	14,522
1912	37,273	1952	16,288
1920	30,832	1953	17,434
1925	28,822	1954	20,363
1929	17,185	1955	17,272
1930	17,106	1956	15,844
1931	16,374	1957	14,144
1932	12,985	1958	12,027
1933	11,685	1959	11,966
1934	13,917	1960	11,770
1935	15,584	1961	10,337
1936	16,060	1962	8,138
1937	20,730	1963	7,756
1938	19,363	1964	7,948
1939	20,342	1965	8,620
1940	19,743	1966	11,789
1941	18,816	1967 (est.)	16,730
1942	13,768	1968 (est.)	14,429

Source: U.S. Department of the Interior, "Fishery Statistics of the United States," Annual Statistical Digest, BCF, 1965 and 1966. Catch figures for 1967 and 1968 are BCF estimates.

Year	Seed Production
	1,000 Maryland Bushels
1961	237
1962	573
1963	932
1964	1,191
1965	1,192
1966	1,364
1967	1,278

Source: "Seed Oyster and Shell Plantings," Annual Reports, The Natural Resources Management Division, Department of Chesapeake Bay Affairs, Annapolis, Maryland, 1961-1967.

Mr. Suttor is Associate Professor and Mr. Corrigan is Faculty Research Assistant, Department of Agricultural Economics, University of Maryland.

Note: This research was supported in part by BCF and Maryland Department of Chesapeake Bay Affairs under Commercial Fisheries Research and Development Act, Project Number 3-42-D. Members of BCF's Division of Economic Research assisted throughout research project and review of article.

U.S. DEPARTMENT OF THE INTERIOR  
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## Fishery Regulations

Over the years, a complex system of State and county laws evolved in response to the decline of the oyster fishery. Although these laws protected the resource from even greater depletion, some restrictions militated against economic efficiency.

There are good reasons for regulating fisheries, both from the conservation and the economic point of view. Conservationists wish to maintain the productivity of the resource. However, increasing demand for commercially valuable seafoods forces up the price, thereby drawing more labor and capital into the fishery. Since the increasing fishing effort will, at some point, permanently damage the resource, conservationists argue for regulations designed to forestall its depletion.

Economists argue for regulation on the basis of efficient resource allocation; that is, labor and capital should be allocated among industries in such a way that the total output of the economy is as large as possible. Unfortunately, when the fishing grounds are not privately owned, too much labor and capital enter the fishery<sup>1/</sup>. Consequently, economists believe that regulations should be devised with a view toward limiting the quantities of labor and capital employed in the fishery.

Regulations<sup>2/</sup> employed in the Maryland oyster fishery include: Closed fishing areas and closed seasons, limitations on technology, tax measures, and private leasing of oyster beds.

### Closed Seasons and Closed Areas

The season for tonging, the most common method of harvesting oysters in Maryland, extends from the middle of September to the end of March. The season for dredging is slightly shorter; it begins the first of November and closes the middle of March. The State also closes certain oyster-producing areas when deemed necessary to protect against overfishing.

A closed season causes specialized equipment to be idle during part of the year. It

also causes a concentration of fishing effort at the beginning of the season. However, the resulting inefficiencies are relatively unimportant in the Maryland oyster industry. This is because investments in specialized fishing gear are small, and most oystermen work either in other fisheries or on nonfishing jobs when not oystering.

Closed areas cause some fishermen to travel further between home port and oyster beds. However, some beds must be closed to improve their productive capacity in future seasons. Thus, the long-term benefits are greater than the immediate costs.

### Limitations on Technology

The limitations on technology in the Maryland oyster fishery are both well known and widely criticized. The complete prohibition on dredging public grounds with mechanical power was recently relaxed to allow power dredging 2 days per week. Only dredging by sail boats is allowed on other days. The impact of this limitation is illustrated by comparing harvesting techniques in the 2 Chesapeake Bay States. In Virginia, where power dredging is lawful 6 days a week, 48 percent of the oysters was harvested by dredges in 1966. In contrast, only 23 percent of the Maryland catch was harvested by dredges.<sup>3/</sup>

There are at least 2 objections to limitations on technology. First, the enforced inefficiency increases the cost of harvesting a given quantity. Second, the artificially high prices resulting from exclusion of the most efficient harvesting techniques induce too much labor or capital, or both, into the industry. Also, in a long-run context, it may be argued that current limitations on technology discourage innovation. A potential innovator may, with some justification, expect the passage of a new regulation outlawing any new efficient gear that he may develop. This would explain why the harvesting methods in the Maryland oyster industry are virtually the same as the methods of the nineteenth century.

### Tax Measures

Taxes are taking on an increasingly important role in regulating the Maryland oys-

<sup>1/</sup> The economic theory underlying this statement is discussed in the Crutchfield and Zellner reference.

<sup>2/</sup> A detailed discussion of fishery regulations can be found in the Scott reference.

<sup>3/</sup> "Fishery Statistics of the United States, 1966."

ter industry. The 1968 session of the State legislature raised the tax on locally produced oysters from 2 cents to 25 cents per bushel <sup>4/</sup>. Also, it increased the tax on oysters shipped out of the State in the shell from 2 cents to 10 cents.

A simulation model of the Maryland oyster industry was used by the authors to evaluate the economic impact of various tax rates. The simulation results (Table 3) include the projected 1975 price, fishing effort, oystermen's income, and tax revenue under three alternative tax rates: 0.31 cent per pound (2 cents per bushel), 3.88 cents per pound (25 cents per bushel), and 5.88 cents per pound.

Table 3 - Projections of Maryland Oyster Industry Under Alternative Tax Levels, 1975

Tax rate (cents per pound) . .	0.31	3.88	5.88
Price (cents per pound) . . . . .	91.4	87.7	85.7
Effort (men) <sup>1/</sup> . . . . .	4,012	3,919	3,866
Net income per man (dollars) . .	2,567	2,526	2,502
Tax revenue (thousand dollars)	42	526	797

Sources: The projections were obtained from a simulation model of Maryland oyster industry. The model will be presented in a forthcoming University of Maryland Agricultural Experiment Station bulletin.

<sup>1/</sup>Effort is defined as number of full-time equivalent oystermen.

An increase in the tax rate causes a decline in the exvessel price and a fall in oystermen's net incomes. So, there is a decline in fishing effort as some oystermen leave the industry or cut down the number of days fished.

The higher tax rates coupled with only minor changes in landings results in substantial increases in tax revenues. By setting an appropriate tax rate, the State can collect enough revenue to pay for the oyster repletion program.

#### Private Leasing

If the oyster beds were controlled by individuals, there would be no need for legal restrictions limiting fishing effort. Long-term leases on oyster beds enable the fisherman to cultivate the beds just as a farmer cultivates his land. If there were a large number of competing firms, as in U.S. agriculture, private leasing would promote efficient use of labor and capital inputs. In addition, the resource would be conserved be-

cause the renter would have the same incentive for conserving his oyster bed as the farmer his land.

Table 4 - Total and Private Catch in Leading Eastern Oyster Producing States, 1966

State	Total Catch	Private Catch	Percent Private
	• • • • (1,000 Lbs.) • • • •		Percent
Maryland . .	11,789	1,437	12
Virginia . . .	9,443	4,639	49
Louisiana . . .	4,764	3,741	79
Texas . . . .	4,725	199	4
Florida . . . .	4,292	238	6
South Carolina	2,615	2,615	100
Mississippi . .	2,232	0	0

Source: "Fishery Statistics of the United States, 1966."

Private leasing is common in many states (Table 4). About 79 percent of the 1966 Louisiana oyster production and 49 percent of the Virginia production were harvested from private beds. On the other hand, only 12 percent of the 1966 Maryland production and 4 percent of the Texas production were landed from private grounds. The argument against extensive private leasing is a non-economic one; namely, that residents of a state should have free access to publicly owned natural resources. Thus, the private ownership question is a question of value judgments, which must be decided in the political arena.

As the above percentages indicate, Maryland has attempted to steer a middle course by leasing some Chesapeake Bay bottom while leaving most acreage open to public fishing. Certain areas may be leased if the area does not contain a natural oyster or clam bar--or if the area produced no marketable oysters in the last 5 years prior to application. As a consequence of these rather severe restrictions, a relatively small acreage has been leased.

#### Conclusions

The many regulations applied to the Maryland oyster industry all tend to reduce pressure on the fishery resource, thereby contributing to the conservation goal. On the other hand, some regulations, particularly limits on technology, hinder the efficient use of labor and capital. However, there is some tendency to move in the direction of regulations conformable with economic efficiency. Notable changes are the partial relaxation of the prohibition on power dredging and the increased tax on oyster landings.

<sup>4/</sup> A Maryland bushel contains 6.3 pounds of oyster meats and usually returns between \$4 and \$5 to the oysterman.

In the absence of a large increase in private leasing, which is unlikely, restrictions will be required to protect the fishery resource. As a result, there will probably be

no radical changes in the foreseeable future in regulations pertaining to closed seasons, closed areas, and fishing gear.

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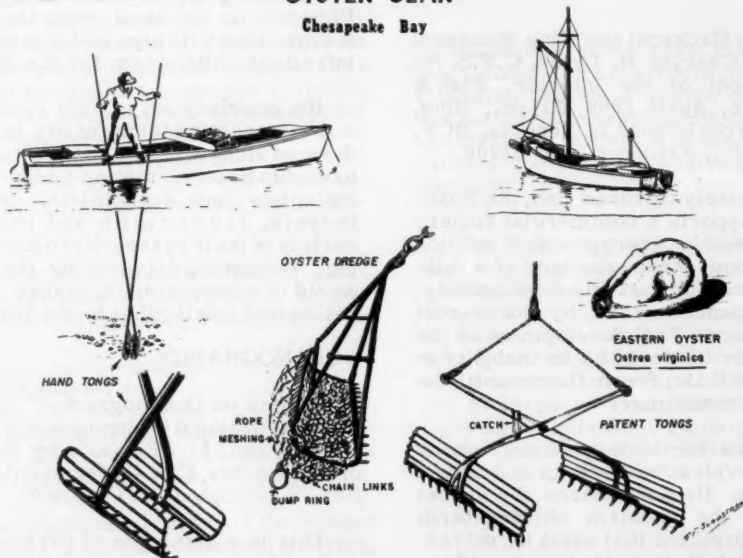
U.S. DEPARTMENT OF THE INTERIOR

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### OYSTER GEAR

Chesapeake Bay





## FISH CULTURE

"Directory of Fish Culture Institutions," FAO Fisheries Technical Paper No. 85, Food and Agriculture Organization of the United Nations, Rome, Italy.

This is a directory of private and governmental institutions engaged in fish culture research in 41 countries, including East and West Germany, Hungary, Israel, Japan, Poland, Netherlands, Taiwan, USSR, and U.S. Prepared by FAO's Department of Fisheries, it lists the location of the institutions, number of scientists employed, physical facilities, research programs, training facilities, and publications.

## MACKEREL

"The Spanish Mackerel and King Mackerel Fisheries," by Charles H. Lyles, C.F.S. No. 4936, Department of the Interior, Fish & Wildlife Service, April 1969, 21 pp., illus. Available free from Branch of Reports, BCF, 1801 N. Moore St., Arlington, Va. 22209.

An oily, delicately flavored fish, the Spanish mackerel supports a commercial fishery that lands a yearly average of 8 million pounds worth about three-quarters of a million dollars. Landings fluctuate considerably, apparently influenced more by the market than by abundance. Full development of the fishery has been hindered by an inability to preserve the delicate, fresh flavor until the fish reaches the consumer.

Lyles reviews the history of the fishery since 1880, provides statistics, and gives several recipes. He emphasizes the urgent need to attack the problem of long-term preservation, a problem that must be solved in order to exploit this enormous, underutilized resource.

## OCEANOGRAPHERS

"The New World of the Oceans: Men and Oceanography," by Daniel Behrman, Little, Brown and Co., Boston, 1969, 436 pp., illus. \$8.95.

The mass media--newspapers, magazines, television, and radio--expend an enormous amount of time and effort telling us of the lives and works of men dedicated to outer space. But where can we go to learn of the lives and works of men dedicated to the study of inner space--the oceans? We can go to this book--an engaging, well-researched, and highly informative account of oceanographers and their science.

Claiming no special knowledge, Daniel Behrman is an ideal reporter. The reader learns along with him, and comes to share his infectious enthusiasm for his subject.

He decided early in his research that the most interesting forms of life in the sea were the men studying it. From Scripps Institution to Woods Hole, he met an unexpected force of biologists and economists, geologists and lawyers, fishermen and physicists. The variety of their research projects is astounding. Behrman, discovering the multifaceted world of oceanography, makes it both interesting and intelligible to the layman.

## OCEANOGRAPHY

"Films on Oceanography," by R.P. Cuzon de Rest, National Oceanographic Data Center, 1969, 99 pp., \$1. For sale by Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402.

This is a catalogue of 155 films on all aspects of oceanography--biology, chemistry, engineering, geology, and physics. It includes

abrief description of each film--and data on size, color, sound, running time, appropriate audience, sources, and cost. Many can be borrowed.

#### SALMON CONSERVATION

"The Pacific Salmon Fisheries: A Study of Irrational Conservation," by James A. Crutchfield and Giulio Pontecorvo, Johns Hopkins Press, 1969, 220 + xii pp., \$6.

As one of the most valuable North American fisheries, the Pacific salmon has an important economic influence. Beyond this importance, however, the industry itself is a good example of the general issues involved in fisheries management--biological yield, conservation, economics, the labor force, and industrial organization. The industry has suffered a chronic economic distress that can be attributed, only in part, to a decline in quantity of output.

James Crutchfield and Giulio Pontecorvo are economists. They have traced the history and analyzed the results of public management programs, particularly as applied to commercial fishing in Alaska and Puget Sound. They point out that public management has failed for the most part because the problems have been treated as strictly biological rather than economic. They offer an alternative program of public regulation based on both biologic and economic criteria. "Productive fish stocks are a necessary, but not a sufficient, condition of optimal use of those stocks," they say. The book makes a compelling case for a stronger economic approach to fishery management and conservation.

The authors also discuss fishing gear, geographic expansion of the fishery, the political environment, and biological constraints.

#### SALMON COMMISSION

"Annual Report 1968," International Pacific Salmon Fisheries Commission, New Westminster, Canada, 1969, 37 pp., illus.

This report includes a review of the Fraser River pink and sockeye salmon fisheries, their history, and the activities of the Commission during 1968. It includes the Commission's plans to restore and increase the value of the fisheries by raising the population beyond its original level.

#### SALMON IN ALASKA

"Alaska's Fishery Resources: The Pink Salmon," by Jack E. Bailey, Fishery Leaflet 619, Department of the Interior, Fish & Wildlife Service, 1969, 8 pp., illus. Available free from Division of Publications, BCF, 1801 N. Moore St., Arlington, Va. 22209.

Salmon fishing is the largest commodity industry in Alaska, and pink salmon is the most valuable species. The pink salmon, also called 'humpback,' is the most abundant Pacific salmon in Alaska. Its production has an average wholesale value of \$28 million and it constitutes more than half the total salmon catch.

Bailey describes the fish, its distribution, abundance, and natural history, and discusses fishery management.

#### SALMON MIGRATION

"Final Report on Migrant Salmon Light Guiding Studies at Columbia River Dams," by Paul E. Fields, North Pacific Corps of Engineers, Portland, Oregon, 1966, 266 + xvii, pp., illus.

Numerous dams have made nearly all of the Columbia River from tidewater to the Canadian border a series of pools. There are facilities to assist adult salmon migrating upstream at all but 2 of these dams, but facilities for young downstream migrants are limited.

The mortality percentages of fingerling and yearling salmonids demand that some method be found to guide them around the dangerous areas in relatively small amounts of water. When this study was initiated, the only generally accepted method of guidance was a mechanical screen. This is not practical in large rivers. The study showed that light is an effective guiding stimulus, both under laboratory conditions and in field-validation experiments.

#### SALT FISH

"Improved Method for Producing Pin-dang," by Sofjan Iljas and Louis J. Ronsivalli, "Fishery Industrial Research," pp. 11-16, Department of the Interior, Fish & Wildlife Service, 1969.

Boiled salt fish, 'pindang,' is a popular food in Indonesia and Southeast Asia. It is known as 'sinaeng' in the Philippines and 'platunung' in Thailand. To produce pindang, alternate layers of eviscerated fish and salt are placed on a rack and held above boiling water in earthenware or tin containers. The containers are covered and the fish steamed for about 8 hours. Pindang can be held for 1 to 12 weeks depending on the concentration of salt.

This paper describes an improved method of production using plastic pouches. With this method, the fish can be stored at room temperature for up to 3 months. The pouches eliminate sanitation problems, double the rate of production, and minimize losses during storage.

#### SPINY LOBSTER

"The New Zealand Rock Lobster or Marine Spiny Crayfish, *Jasus edwardsii* (Hutton)--Distribution, Growth, Embryology and Development," by J. H. Sorenson, Fisheries Technical Report No. 29, New Zealand Marine Department, Wellington, 1969, 46 pp., illus.

Crayfish, or rock lobster, has become the most valuable single species in New Zealand's fishing industry. This is due mostly to a strong demand for frozen tails in the U.S. After reaching a peak in 1956, landings declined in volume and in size of individual fish. Later, huge unfished stocks were discovered off Chatham Islands, and a new record of 159,102 cwt., worth NZ\$4,319,908, was reached in 1967.

A fishery of this magnitude and value must be wisely managed to achieve a balance between natural increase and exploitation. The protection of females carrying external eggs

is essential. This report describes and illustrates a technique to determine whether unlawful egg-removal has taken place. It includes the life history and biology of the species, and discusses initial steps taken towards laboratory rearing and 'farming.'

"The New Zealand Crayfish, *Jasus edwardsii* (Hutton)," by R. J. Street, Fisheries Technical Report No. 30, New Zealand Marine Department, Dunedin, 1969, 53 pp., illus.

This is an account of the growth, moulting cycle, movements, reproduction, and predators of the New Zealand crayfish.

#### TECHNOLOGY

"The Automation of Fish Processing and Handling - A Bibliography," by Garland L. Standrod, Department of the Interior, 1969, 37 pp. Available from Clearinghouse, Springfield, Va. 22151.

This is a selected list of 312 reports and articles, some in foreign languages, covering all aspects of automated fish processing and handling.

#### U.S. FISHERIES

"Fisheries of the United States. . . 1968," by Charles H. Lyles, C.F.S. No. 5000, Department of the Interior, Fish & Wildlife Service, March 1969, 83 + xx pp. Available from Division of Publications, BCF, 1801 N. Moore St., Arlington, Va. 22209.

A complete review and analysis of U.S. catch, landings and value, imports and exports, production and supplies, by species, region, and type of product. It includes sections on prices, per capita consumption, and numerous statistics.

--Barbara Lundy



# INTERNATIONAL

## Super-Seiners Slated for West African Waters

The 'Biscaya,' a 1,082-ton French-flag tuna purse seiner left Bayonne recently for West African waters. Her departure heralded a new phase in European eastern Atlantic tuna fishing. The U.S.-designed tuna seiner, the largest ever built in Europe, is the forerunner of a new fleet of super seiners for the French, Spanish, and Italian fleets.

Previously, only a few purse seiners had sought tuna off West Africa. This has been attributed to insufficient knowledge of the grounds and waters of the Gulf of Guinea, and of fishing with the purse seine.

### American Influence

But in 1968, the Americans came with their huge modern purse seiners and their helicopters. Their success and obvious efficiency had a tremendous effect. In fact, their success in the Pacific was already being closely scrutinized by European and African fishing interests eager to exploit West African tuna resources.

### Japanese Plans

One Japanese owner had sent a new 250-ton-hold capacity tuna purse seiner to operate off West Africa in 1968. He is to replace it this year with one of 1,000-ton-hold capacity, such is the increased overall efficiency of the larger vessels.

### Other Countries

Italian interests are planning one or more 1,000-ton-capacity purse seiners as are owners in Spain. One Spanish owner is reported to be studying conversion of the revolutionary suction purse seiner 'Sarasua' into a U.S.-style vessel.

### French Operations

The French, who have had perhaps the strongest tuna fleet off West Africa, also have been watching developments with these large super-seiners.

In 1968, there were 35 French tuna freezers, 17 purse seiners, and 18 bait boats in the area. They increased production by 50% over the previous year, due to the conversion of many bait boats into purse seiners. Now, this freezer fleet is to be greatly expanded. France hopes to play a larger role in the production of tuna for both the EC and the international market. They have chosen the most efficient type of vessel available in order to compete on an equal basis.

### Characteristics of Biscaya

The all-welded steel-hull Biscaya is 53.95 m. (177 ft.) long overall, 50 m. (164 ft.) bp., and moulded breadth is 10.87 m. (36 ft.). Depth to main deck is 5.89 m. (19 ft.), and draft aft 6.40 m. (21 ft.). She has a two continuous deck construction, the engineroom is forward and all accommodation is in the deck-house superstructure.

Although fitted with as much European equipment as possible, she still has a good deal of American machinery aboard, notably the fishing gear. ('Fishing News International,' May.)



## Atlantic Albacore Fishery Developments

In early June, about 15 Japanese longliners were fishing albacore tuna in the Atlantic off Angola and South Africa. They were catching a daily average of 2.5-3 tons per vessel. This is considered normal for the season, but is somewhat below the same period last year when many small albacore were taken. About 50 Taiwanese and 25 South Korean tuna vessels also were reported fishing albacore in the region.

### Prices

In early June, c. & f. prices for frozen round albacore exports to Puerto Rico were around US\$510 a short ton for 40-pound fish and \$480 for smaller sizes taken off Angola. Export prices for frozen round albacore deliveries to California were about c. & f. \$544

Export prices for frozen round albacore deliveries to California were about c. & f. \$544 a ton for 30-pound fish. ('Suisan Tsushin,' June 5.)



## FAO & USSR Sponsor Caribbean Fishery Study Tour

Fishery scientists from Latin America took part in a study tour aboard a Soviet oceanographic vessel in the Caribbean Sea June 22 to July 25. The group fellowship study tour was sponsored jointly by the USSR and the United Nations Development Program. The USSR, though not a member of FAO, contributes to UNDP.

### Fishery Lectures

Some 20 fishery biologists and oceanographers from various Latin American countries, including Brazil, Costa Rica, Cuba, Mexico and Uruguay, were aboard the 3,730-ton research vessel 'Akademik Knipovich'. They heard lectures on modern methods of fishery and marine research, and received instruction in the use of acoustical equipment and other fishing and navigational aids.

They also were scheduled to visit marine and scientific institutions in Belem, Brazil--starting point of the tour--Havana, Cuba, and Vera Cruz, Mexico, where the tour ends.

The Akademik Knipovich carried out exploratory fishing and marine biological research en route. The findings will be published by interested governments.

### Third Tour

The tour is the third of its kind. Previous tours were held aboard the Knipovich in the southern Mediterranean Sea last year, and in the Black Sea in 1967. Participants in these tours came from African, Asian and East European countries.



## Japan and Mauritania Reopen Negotiations

Japan and Mauritania were scheduled to reopen fishery negotiations at Nouakchott on June 10. This will be the two countries' third attempt to agree on allowing Japanese trawlers to operate in Mauritania's 12-mile exclusive fishery zone.

The first talks were held in Tokyo in fall 1968. The basic understanding was that Japan would pay Mauritania US\$277,800 entry fees for 69 trawlers planning to catch 10,000 metric tons of octopus. Talks at Port Etienne in Dec. 1968 were broken off because Mauritania requested fishery assistance over and above that offered by Japan.

The latest negotiations may settle the problem. The 8-man Japanese negotiating team will include 2 government officials. ('Suisan Tsushin,' May 14.)



## Japanese Longliners Asked Not to Fish Off New Zealand

The New Zealand Government reportedly has sent a request to the Japanese Foreign Office asking that Japanese tuna long liners fishing off her shores move into other areas. Close to 100 long liners were fishing for southern bluefin off New Zealand. Many of them had shifted from southeast Australia where the southern bluefin resource has declined. Since they operate beyond New Zealand's 12-mile fishing limit there is no legal problem. However, the presence of a large number of Japanese vessels is causing some concern. ('Suisancho Nippo,' May 27.)



## Soviet Whaling Flotilla Calls at Las Palmas

Returning from the Antarctic, one of the 3 Soviet whaling factoryships, 'Iurii Dolgorukii', called for 4 days at Las Palmas, Canary Islands. She was accompanied by 15 catcher boats and a support vessel. The whaling flotilla was on its way to home port at Kaliningrad. During past years, the Iurii Dolgorukii

flotilla usually stopped at Montevideo, Uruguay. The vessel arrived at Kaliningrad on May 19.

The Soviets have been using Las Palmas more and more since the closure of the Suez Canal. The exact number of Soviet fishing vessels calling at Las Palmas is unknown, but it may approach 100 during 1969.

Another Soviet whaling factoryship, the 'Sovetskaia Ukraina', accompanied by 20 catcher boats, called at Ceuta, a Spanish port in northern Morocco, on her way to the fleet's home port of Odessa.



### Research Vessel Visits Cape Town

The 'Bakhchisarai,' research vessel of the Atlantic Research Institute of Fisheries and Oceanography (ATLANTNIRO), called at Cape Town, South Africa in early May. The vessel was visited by scientists of the Fisheries and Oceanography Department of Cape Town University. The South Africans said afterwards that their research vessel, the 'Thomas B. Dave,' compares to the Bakhchisarai "like a jalopy compares to a Rolls Royce."

Before leaving Cape Town on May 9, the Soviet scientists and crew toured the city and visited fishery research facilities. Despite the exuberant South African appraisal of the Soviet research vessel, some of her crew members found Cape Town more attractive: they missed the vessel's departure and had to be taken to her in a sloop.



### Adriatic Fisheries Agreement Signed

Italy & Yugoslavia have signed a 3-year Adriatic fisheries agreement replacing one that expired in December 1968. Under the old agreement, the Italians had obtained 195 permits to fish their historic grounds on the Yugoslav side of the Adriatic. Under the new agreement the permits will be reduced to 165 in 1969, and 140 in 1971. In addition, the

Yugoslavs have limited Italian fishing to vessels not exceeding 80 gross tons with 220 hp. engines. ('La Pesca Italiana,' May 1.)

The Italian Fisheries Association, pointing out that the agreement was the best the Italian delegation could reach, noted that it was not happy with the decrease in fishing permits. It believes Yugoslavia intends to push Italian fishing in Yugoslav waters towards the south Adriatic where resources are less abundant. The Association, recognizing that there is little that can be done to reverse this trend, called on the Italian Government to adopt a policy of "large vision"--a policy that would permit Italians to begin fishing in "more distant" grounds.



### Southeast Asia Fisheries Development Center Operations

The Research Department of the Southeast Asia Fisheries Development Center is scheduled to start functioning by September 1969. Research vessels, contributed by Japan, were to be available for trial runs in July, and fully operational before the end of 1969. A Training Department building is to be started in the summer of 1969 and completed by mid-1970. Crew training will begin in late 1970. The Research Department buildings at Changi are almost complete, and equipment will be installed soon.

#### U.S. Aid Grant

It has been requested that funds from the projected U.S. contribution of US\$100,000 be made available without restrictions on buying fuel and insurance for research vessels. This would enable the Research Department to begin the first year's operations. U.S. AID grant had limited funding to items only of U.S. origin. The grant was not to cover vessel fuel and insurance costs. However, AID has approved lifting the restriction. (U.S. Embassy, Bangkok, Apr. 4 & 14.)



# FOREIGN

## CANADA

### NEW TERRITORIAL SEA AND FISHING LIMIT BASELINES DRAWN

New Canadian baselines delineating territorial sea and fishing limits along the east coast of Nova Scotia and the west coasts of Vancouver Island and Queen Charlotte Islands have been announced. Regulations took effect on June 11.

Existing treaty rights and traditional fishing activities will be recognized, pending conclusion of negotiations with the U.K., Norway, Denmark, France, Portugal, Spain, Italy, and the U.S. (U.S. Embassy, Ottawa, June 4.)

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### FIRST-QUARTER LANDINGS IN MARITIME PROVINCES WERE AT 1968 LEVEL

Landings in the Canadian Maritime Provinces Jan.-Apr. 1969 were 205 million pounds worth \$13.7 million exvessel. In the 1968 period, 205 million pounds worth \$12.3 million were landed; in 1967, 141 million pounds valued at \$10.3 million.

April 1969

During April 1969, total fish landings in the Maritime Provinces (N.S., N.B., P.E.I.) were 54.1 million pounds worth C\$5.3 million exvessel. The April landings included 34.1 million pounds of groundfish, \$2.3 million; 15.7 million pounds of pelagic and estuarial species, \$195,000; and 4.3 million pounds of shellfish, \$2.8 million.

The quantity and value of April 1969 fish landings were below April 1968. The April 1969 catch was 4.3 million pounds below the 3-year (1966-1968) average, but value was \$547,000 above the 1966-1968 average.

### Fishery Ups & Downs

During April, landings of cod, redfish or ocean perch, halibut, and flatfish were below the 1966-1968 average. Landings of haddock, herring, and lobster were above. Scallop landings were the same.

Landings by trawlers and draggers over 70 feet long totaled 29.1 million pounds--81.8% of groundfish landings and 93.6% of scallop landings. (Canadian Dept. of Fisheries and Forestry, May 27.)

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### FISHERIES MINISTER WARNS OF OVERFISHING QUEEN CRAB STOCKS

Overfishing queen crab stocks off Canada's Atlantic coast is a possibility, warned Jack Davis, Canadian Fisheries Minister, at a recent meeting in Fredericton, N.B. Despite a tenfold increase in production since the early 1960s, little is known about the resource. Moreover, a threat exists from unlimited entry of Canadian companies into the fishery. Davis called for serious consideration of limitation of entry into the queen crab fishery. ('Fisheries of Canada,' Apr.)

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### GOVERNMENT BUYS FROZEN GROUND FISH

Contract awards by the Fisheries Prices Support Board to buy slightly over one million pounds of frozen groundfish products were announced May 14 by Fisheries and Forestry Minister Jack Davis. The purchases are being made under the Board's program of assistance to the industry announced April 24. The program objective is to prevent distress sales by producers and to stabilize market. First tenders were opened on May 12. Further tenders will be opened every 2 weeks for duration of program.

### Program's Goal

The Board's initial awards are being made within a price range of 23.75 to 24.50 cents a pound for frozen-cod blocks. Davis said he was pleased with improvement in the market since the Government first announced in February its decision to intervene. Since then, the price for cod blocks, delivered Boston, has risen from 21 to 24 cents a pound. The program's goal is to raise depressed market prices to a level comparable with costs of efficient producers. Davis said

## Canada (Contd.):

additional purchases will be made until objective is reached. (Canadian Dept. of Fisheries and Forestry, May 14.)

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## SALT FISH ADVISORY COMMITTEE FORMED

Formation of a Salt Fish Advisory Committee has been announced by Canada's Fisheries and Forestry Minister, Jack Davis. The Committee consists of 8 members of the Atlantic Coast industry. It will advise the Minister on current problems and on the effects of government assistance programs. A deficiency payment program for the current year was announced on April 25. The Minister said that reorganization of the industry will begin next year. (Fisheries Information Service, June 4.)

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## INVESTIGATES DISCOLORED NEWFOUNDLAND HERRING

The occurrence of discolored or red herring in limited areas in Placentia Bay and St. Mary's Bay in Newfoundland has been studied by the Canadian Department of Fisheries and Forestry since early Feb. 1969, when they were first noticed. The occurrence close to a new phosphorous plant raised the possibility that the fish deaths were caused by the plant's effluent. However, there is no proof of this.

## Investigation Intensified

The Department's investigation is being intensified, and the Federal Department of Health and Welfare has been asked to study the dead fish. As added precaution, fishing in Placentia and St. Mary's Bays is being watched constantly. No fishing boats are active there. No fish that could possibly have been contaminated by effluent from the phosphorous plant is being processed for sale. (Canadian Dept. of Fisheries and Forestry, May 1.)

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## CONFERENCE ON FISH INSPECTION AND QUALITY CONTROL

Fishery experts from almost 40 countries met in Halifax, Canada, July 15-25, to discuss how to promote and improve inspection services to assure high quality standards for fish and fish products. The experts were attending the first Technical Conference on Fish Inspection and Quality Control. More than 200 fish inspectors, technologists, biologists, administrators and other specialists representing government, industry and private institutions participated.

The conference discussed the organizational aspects of fish inspection, principles of quality control and new, improved methods of determining quality and preserving freshness and edibility. They also reviewed standards and techniques used in different countries of the world.

The need for improving and enforcing inspection services was emphasized in a paper prepared by FAO. In developing countries, especially in the tropics, the paper stated, inspection systems can help to develop modern fishing industries and make a country's products more acceptable in international markets.

Papers were presented on subjects ranging from consumer evaluation of fresh and frozen fish, ultrasonic inspection of parafrozen whole fish, and the training of fishery inspectors, to theoretical and practical considerations in the development of grade standards for fishery products.

The significance of the meeting was emphasized by Roy I. Jackson, FAO Assistant Director-General for Fisheries, who said it was "a major first step towards establishing national and international standards for fish inspection and quality control; the need for which is becoming more and more apparent". (FAO News Release, June 30.)



## EUROPE

### USSR

#### MAY JOIN INTERNATIONAL MARITIME COMMITTEE

Soviet jurists interested in maritime law created the Soviet Maritime Law Association in 1968. Its president, Andrei Zhudro, has stated that the Association would seek to join the International Maritime Committee, which was scheduled to meet at Tokyo in April 1969. The USSR is party to almost all major conventions and agreements governing navigation and other marine activities. One is the Inter-Governmental Maritime Consultative Organization, which governs the conduct of maritime trade. (TASS, Mar. 11.)

The Soviet Union's fishing fleet is the largest and most modern in the world. Her merchant marine is sixth among maritime nations.

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#### COOPERATES IN INTERNATIONAL BALTIC SEA RESEARCH

The Soviet research vessel 'Mazirbe' left Riga on May 9 to begin a new phase in unified international research of Baltic. Six countries are participating: Finland, USSR, Sweden, East Germany, Poland, and West Germany.

Systematic international investigation of the Baltic began in 1964. A synoptic-hydrological survey made at that time has helped oceanographers devise methods for calculating the temperature fields of sea waters and currents. These calculations are essential for navigators of merchant and fishing vessels.

Ten permanent hydrological stations have been set up to observe water temperature, currents, salinity, chemical composition and wave patterns. Their aim is the study of the environment of living organisms in the Baltic. This research will be important in the future development of the local fishing industry. ('Pravda,' May 10.)

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#### NEW ICHTHYOLOGY LABORATORY OPENS

A new ichthyology laboratory to study the biology of valuable commercial North European fish species has been opened by the Polar Research Institute of Fisheries and Oceanography.

##### To Study Salmon

The laboratory's new station at Por'ya Guba on the Kola Peninsula (Kandalaksha Gulf) will conduct research on Atlantic salmon. Surveys are planned of the principal salmon spawning grounds on the Ponoy, Varzuga, Umba, and Kola rivers.

##### Breeding Studies

Three fish hatcheries on Kola Peninsula are studying the biotechnical aspects of Atlantic salmon breeding. They are releasing fry directly into the sea, not into rivers. ('Vodnyi Transport,' Apr. 5.)

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#### FISHERMEN ASKED TO AID ACADEMY OF SCIENCES

Rocks caught in the trawl net of a Soviet fishing vessel in the southeast Atlantic may contribute to the knowledge of phosphorite formation on the ocean bottom, according to a scientist of the Oceanology Institute of the Soviet Academy of Sciences. The rocks had been sent to the Institute for analysis.

##### Rock Samples Sought

The scientist was appealing to Soviet fishermen to send the Institute samples of rocks lifted in nets. He asked for precise data on vessel location, trawling depth, and total weight of "rock catch."

Soviet fishing vessels operate in all oceans at all latitudes and can assist Soviet oceanologists in exploring various phenomena. ('Vodnyi Transport,' Apr. 17.)

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## USSR (Contd.):

## POLYETHYLENE BAGS USED FOR FREEZING FISH

For the last 2 years, AZCHERRYBA (Azov-Black Sea Fisheries Administration) trawlers have been wrapping frozen fish blocks in polyethylene bags. This makes it possible to store them up to 5-6 months. With conventional freezing procedures (without wrapping), glazing disappears after 2-3 months, fat becomes rancid more rapidly, the fish dries out, and its quality deteriorates.

About 1,500 metric tons of polyethylene-wrapped frozen fish were put on the Soviet market in 1967. Chemical laboratories of various fish-processing plants had approved its quality after prolonged storage tests. They established that water vapor maintains a constant pressure inside the bag. This slows sublimation of the ice and makes it possible to retain glazing for 5 to 6 months.

## Tested Aboard Trawlers

Aboard 2 'Tropik'-class stern trawlers, tests with sardines and horse mackerel revealed that polyethylene-wrapped frozen fish not only retained its high quality after 5 months of storage but could be used for canning and smoking without previous sorting. Glazing on the fish blocks was virtually intact. Unwrapped fish blocks lost their glazing during same period. Frozen unwrapped sardines yellowed and smelled slightly of rancid fat; the horse mackerel were dark on the surface with slight subcutaneous yellowing. Both had to be carefully sorted before further processing.

Although wrapping operations have pushed up frozen fish costs 17 rubles (US\$18.70) per ton, savings resulting from longer storage life, reduced waste, and improved quality will compensate for the added cost. ('Rybnoe Khoziaistvo,' Feb.)

## Recent Development

In U.S. and Western Europe, fishery products have been wrapped in plastic bags for over a decade. In USSR, both fishing and marketing are controlled by state, and most investments have gone into developing a large fishing fleet. The movement to improve quality and packaging is quite recent.

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## NEW BOTTOM TRAWL DESIGNED

A new bottom trawl has been designed by the Central Design Office of the Northern Fisheries Administration. Its main feature is the 5.2-meter-high opening, twice that of conventional trawls (2.6 meters) used by Soviet fishing fleet. Tests have shown the catching efficiency of trawl nets with the larger throat considerably greater.

The new bottom trawl was approved for mass production. Its distribution will begin this year. ('Vodnyi Transport,' Apr. 8.)

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## TO EXPLOIT NORTHEAST ATLANTIC SNIPEFISH FOR FISH MEAL

Large commercial concentrations of snipefish have been discovered in the northeast Atlantic. The Soviets plan to develop a large-scale fish meal fishery there. Because it is small (8-11 cm. or 3-4 inches), the species appears unsuitable for food.

## Area Surveyed

Surveys were conducted Aug.-Dec. 1967 and Mar.-June 1968 by 2 vessels of the Northern Exploratory Fishing Bureau of SEVRYBA (Soviet Northern Fisheries Administration). They covered a wide area of northeast Atlantic, between 33° and 50° N. latitude and 10° to 35° W. longitude. Area includes West European and Iberian Basins, Azores Plateau, Azores Rise, and Azores Islands. In Oct. 1967, large commercial concentrations of snipefish were discovered in an 8,400-square-mile area, west of the Iberian Peninsula. In Apr.-May 1968, large schools were tracked south of 39° N. latitude in a 300-square-mile area on Gettysburg Seamount, north of Madeira, and southeast of Azores.

## Electric Light Fishing

At night echo-sounders located snipefish schools both at 30-70 meters and near the surface. Snipefish react to electric light and will gather in large schools in an area lit by blue surface lamps. The school follows the light moving very slowly in a horizontal direction. However, vertical movements are fast, and the school may drop rapidly to 110 meters. If the blue light is switched off and a red light turned on, the school rises rapidly to surface, "boils," makes considerable

**USSR (Contd.):**

noise, and stays in the illuminated area, circling at 2-3 meters.

**Catches**

Catches, as high as 10 metric tons per haul, averaged 2 to 5 tons a haul. SRTM-class vessels fishing with electric light can catch 20-30 tons a night. Electric light fishing with pumps, as practiced in the Caspian, has been recommended. ('Rybnoe Khoziaistvo,' Jan.)

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**PLANS TO FISH HAKE OFF CAPE TOWN**

The R/V 'Atlant' has discovered dense schools of deep-sea hake in a 240 square mile area off Cape Town (South Africa) at depths of 280 to 420 meters (918-1,370 feet). The Soviets have not yet exploited Cape Town fishing grounds commercially, although reportedly these grounds have a great potential.

Atlantis is a vessel of the Atlantic Research Institute of Fisheries and Oceanography and the Institute now is drawing up plans for large-scale fishery operations off Cape Town. ('Vodnyi Transport,' May 22.)

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**'VITIAZ' IS ON 45TH SCIENTIFIC CRUISE**

The Soviet research vessel Vitiaz left Vladivostok on April 23 for the Sea of Okhotsk. Final destination is the Gulf of Alaska and the Aleutian Trench, where scientists will carry out complex oceanographic work and study biological phenomena at great depths.

The vessel returned in March from a 4-month research cruise in equatorial Pacific.

**United Kingdom****MERGER CREATES FISHING FLEET OF 120 VESSELS**

Arrangements were expected to be completed by July 1 for the merger of Britain's 2 largest deep-sea trawler fleets. Merger under one company would supply about half the

white fish landed in Hull and Grimsby and about one-fifth all British-caught supplies.

The fleet will number about 120 vessels, including 10 freezer stern trawlers, one of the world's largest.

**Reasons for Merger**

Talks began in August 1968 with the help of the Industrial Reorganization Corp. The intention was to improve the efficiency and productivity of the deep-sea trawler industry by combining its many companies. This would provide basis of a strong, successful company capable of introducing new managerial and other skills.

**Ross & Associated Fisheries**

Originally, 3 of the largest companies were involved--the Ross Group, Associated Fisheries, and Boston Deep Sea Fisheries. Earlier this year, Boston withdrew.

The fish-distribution interests of both groups will be operated separately--competing with each other and the distributive trade. ('Fishing News International,' May.)

**Norway****FROZEN FILLET EXPORTS TO U.S. INCREASE**

Production and sales of frozen fish fillets have been exceptionally high for the past year. There were ample supplies of cod and other groundfish and a brisk demand in major export markets.

In 1968, exports to the U.S. almost tripled to 22,200 tons. About 25% of the frozen fish fillets exported to the U.S. was supplied by "Nordic Group A/L". In Feb. 1968, Nordic group was granted export rights to the U.S. for one year. (These rights have been extended for another year.)

**Frionor's Rising Sales**

"Norsk Frossenfisk A/L" (Frionor) enjoyed exclusive export rights to the U.S. until last year. Frionor reports that its rising sales in the U.S. are due partly to increased capacity at its New Bedford fish plant.

## Norway (Contd.):

Frionor also reports changing consumer preferences in the U.S., including an increasing demand for "natural" fish products (whole, unskinned frozen fillets). (U.S. Embassy, Oslo, Apr. 26.)



## Denmark

### MORE STERN TRAWLERS FOR FAROE ISLANDS

The Faroese fleet has been dominated by many wood and steel longline vessels and relatively few large steel side trawlers. By late 1968, 14 modern steel longline vessels had been converted to power-block purse seining; 5 new purse seiners were on order. One or 2 stern trawlers were delivered during 1968 and 3 were purchased in 1969.

Two of the new vessels will supply herring to fish-meal plant at Fuglefjord. One is a freezer trawler delivered by Norwegian yard.

The Faroese firm that took delivery of modern freezer stern trawler in late 1968 plans to own and operate about 10 similar vessels within 5 years. The factory freezers were designed primarily to supply U.S. market for frozen cod blocks.

One owner recently commented that U.S. demand for frozen Faroese cod blocks is excellent. His firm had contracts with 9 of largest U.S. cod block buyers.

Faroese trawler owners claim their operations involve no risk whatsoever. (U.S. Embassy, Copenhagen, May 23.)

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### EXPORTS OF FROZEN FILLETS

Danish exports of cod fillets to the U.S. resumed following low prices and stagnation in fall 1968. Supply had been greater than U.S. demand. The situation improved early in 1969. This was due to steadily growing U.S. consumption--and because fisheries on several North Atlantic cod-fishing grounds declined during 1968.

## Plaice Fillets Exports Drop

Exports of plaice fillets to Britain have declined as a result of the 10% customs duty applied in late 1968. This duty caused considerable difficulties for Danish fillet exporters. They produce 10,000-11,000 metric tons of plaice fillets per year, much of which has gone to Britain.

New negotiations on the frozen fillet problem began May 20 in London. Arrangements made there will enter into force in Jan. 1970. The Nordic countries, which protested strongly the British duty, hope it will be removed or relaxed. (U.S. Embassy, Copenhagen, May 23.)



## Greenland

### PROBLEMS CONTINUE IN FISHERIES

The Director of the Royal Greenland Trade Department (RGTD) reported a loss of US\$2.7 million during 1968. RGTD processes about 80% of Greenland's catch. The loss was due to a drop in the cod catch and to difficulties on world markets for major Greenlandic fishery products. Fishermen fear that cod have left the Greenland coast, but biologists say it is still present, though the population fluctuates greatly. RGTD purchased 17,500 metric tons of cod in 1968 down 30% from 23,200 in 1967. Private fish processing plants in Greenland reported a 2% decline. Districts north of Godthaab, Greenlandic capital, experienced a 60-80% decline in cod catches, apparently a result of smaller stocks.

### West German Competition

West German stern trawlers were said to have accounted for the greatest share of the increase in total catch from waters off Greenland. Their average daily catch was more than 20 tons. The Germans begin fishing as early as December, continue through July, and withdraw during August.

### New Stern Trawlers

Biologists have emphasized that the cod stocks have been fully utilized for some years and that if Greenlanders desire greater catches, they must compete with other countries fishing the same grounds. The delivery of 'Nuk,' the Trade Department's large, new

## Greenland (Contd.):

Norwegian built, stern trawler should help. The new vessel is fully equipped with modern electronic equipment. She will operate both bottom and midwater trawls. The Nuk is expected to operate at a yearly loss of about US\$133 thousand, interest and depreciation included. Her annual catch is estimated at 3,000-4,000 tons. She will be used to train Greenlandic fishermen and will provide experience needed to operate the next two vessels in this series. These are expected to enter the fishery in 1971.

### Plans for Future

Despite an unsure future outlook and the great expense of investing in large seagoing vessels, the RGTD Director said it would be wrong to halt development now. Basic concepts have still not yet been tested fully, he added. The Director considers that the Danish Government must support initial development of the high-seas fishery because it is the sole basis for industry in Greenland.

### Subsidy Refused

The Greenland fishermen's proposal for State support was refused by the Minister for Greenland recently. The Minister said that fishermen in "South Denmark" do not receive such subsidization. The basis for the fishermen's request was a drop in income from US\$4 million to US\$2.7 million in 1968. The foreman of the Greenlandic Fishermen's Association pointed out that if the fisheries do not improve significantly in 1969, many members will be unable to meet payments on their vessels. (U.S. Embassy, Copenhagen, May 23.)



## West Germany

### BUILDS 3 TUNA VESSELS FOR PORTUGAL

Three 34-meter (111.6-ft.) long tuna purse seiners for the Lisbon-based firm, Congel Cia de Pesca e Congelacao de Cabe Verde S.A.R.L., have been built in the Bremerhaven yard of A. G. 'Weser' Work Seebeck. The 'Salamanza' was completed at the end of February. She left soon after for St. Vincent in the Cape Verde Islands. The 'Mordeira' and the 'Pedro Badejo' were completed about a month later.

### Purse Seining

Each vessel carries a 17-ton, 1,500 m. (4,920 ft.) long net, accommodated on a special platform on the afterdeck. Normally in purse seining, the skiff positions the net in a wide circle, while the mothership stays on station and pays it out. However, because of the great size and weight of the nets this order will be reversed. The 150-hp. skiff (carried aboard mothership) will stay on station. The net will then be closed and hauled in the usual manner, the fish will be brailled out, and the skiff hoisted aboard. Derricks with a capacity of 2 tons and 10 tons will be used. The large tuna purse seines will be handled with a power block.

### Freezing Method

The fish is deep-frozen in stages through brine baths starting at a temperature of  $-10^{\circ}$  C. ( $30.2^{\circ}$  F.) and ending with a brine temperature of  $-7^{\circ}$  C. ( $19.4^{\circ}$  F.). After 72 hours of brine-freezing, the fish are dry-frozen at  $-18^{\circ}$  C. ( $-0.4^{\circ}$  F.).

Other specifications of the 361 gross ton vessels are: breadth 9.30 m. (30.5 ft.), and height to main deck 4.40 m. (14.4 ft.). They are fitted with 1,000-hp. 380 r.p.m. engines giving a speed of  $11\frac{1}{4}$  knots. ('Fishing News International,' May.)



## Changing Icelandic Fisheries

David K. Sabock

Fishing, Iceland's most important industry, accounts for 90% of her exports. Historically, fishing has dominated the national economy, placing Iceland in the vulnerable position of a country with a one-crop economy. That crop is in trouble. Few alternatives are available. Landings have declined, international market problems have developed, and the processing industry suffers from high costs and overinvestment. These troubles have led to extensive government assistance to the industry, and caused serious problems in foreign exchange earnings. For example, the kronur had to be devalued twice in the last year--from 43 per US\$1.00 to 58 to the dollar and, in November 1968, to 88. This was not enough to prevent a proliferation of labor unrest and requests for government aid. The fishing industry is so important to the economy that any governmental action or inaction carries heavy political consequences.

Iceland is seeking membership in the European Free Trade Association (EFTA). This has prompted considerable local interest in the probable treatment of Iceland's products in intra-EFTA trade, and in duty and quota treatment for frozen-fillet exports to Great Britain in particular. Politically, these negotiations are among Iceland's most controversial issues.

### Major Changes

The industry is undergoing major changes. Effort is shifting away from herring towards the more valuable groundfish species. More emphasis is being given to increased pre-export processing of fishery products. A more efficient processing industry is being sought through plant closings and mergers.

### Dramatic Decline in Landings

Although the catch tripled from 1956 to 1966, landings have fallen drastically since. After a record 1.2 million metric tons in 1966, the approximately 6,000 Icelandic fishermen caught only 599,000 tons in 1968--33% less than 1967.

Mr. Sabock is Foreign Affairs Officer, Office of Foreign Fisheries.

### Herring Catches Shrink

The tremendous drop in herring catches since 1966--over 80%--is the primary cause of the decline, just as the large increase in herring catches was responsible for the boom years of the mid-1960s. Despite this, herring still made up almost 25% of the 1968 catch; herring and capelin together supplied nearly 40%. Two years earlier, two-thirds of the catch was herring; in 1967, it was half. Reduced herring catches have been attributed to fluctuating weather conditions adversely affecting the Atlantic-Scandinavian stock migrations. It is possible that the Scandinavian herring resource has shrunk and may not recover in the near future.

### Cod Catches Increasing

Cod was the dominant species in 1968 and accounted for 40% of the catch. Over 235,000 tons were landed, 15% above 1967 and slightly better than 1966. This large percentage of cod reflected not only significantly lower herring catches, but a concerted effort to fish other species. Saithe, haddock, and ocean perch were other important landings. These species, with cod, herring and capelin, made up 93% of the landings.

### 1963-1968 Catches

Year	White Fish	Herring & Capelin	Total
	..... (1,000 Metric Tons) .....		
1963	374.8	303.9	679.7
1964	418.5	553.0	971.5
1965	386.3	812.7	1,199.0
1966	344.7	895.6	1,240.3
1967	337.8	558.7	986.5
1968 <sup>1/</sup>	378.3	221.0	599.3
<sup>1/</sup> Preliminary.			

### Changes in Utilization

In recent years, most of the catch has been used for reduction. It demonstrates a tendency to use herring and capelin for fish meal and oil. This tendency was reversed in 1967 and 1968. The decreased herring catch and low prices in the international fish meal market have combined to reduce the proportion of the catch used for industrial products.

## Freezing Increases

Freezing, reduction, and salting are the primary forms of processing, but there have been changes in their relative importance. The amount of fish frozen increased in 1968 over 1967; this replaced reduction as the principal form of processing. The output of salted fish also exceeded the amount used for reduction. In 1968, 34% of the catch was frozen, 24% salted, and 22% processed into fish meal and oil. In 1967, 53% had been reduced, 19% frozen, and 14% salted. Another significant change in 1968 was the large increase in the amount of canned fish. Although still a very small portion of the whole, the importance of canned fish probably will increase over the next few years. The stimulus for this development is the same that caused the other utilization changes in 1968--an emphasis on those forms of processing that command the highest export value and promise the best marketing prospects.

## Fish Meal & Oil

For fish meal and oil production, 1968 was the poorest year since 1960. Fish meal production declined 51%; it was 112,800 tons in 1967 and 55,000 in 1968. Oil output dropped 79% from 70,000 to 15,000 tons. Iceland has about 48 plants with individual daily capacities ranging from 100 to 1,500 tons. Eight of the largest plants are state owned.

The almost complete loss of the Nigerian market over the past two years also has cut into stockfish production and exports. The better quality raw material was frozen or salted. Attempts to find or develop alternate African markets have not been successful.

## 1967 & 1968 Catch Disposition

	1968	1967
<b>Fish:</b>		
Quick frozen . . . . .	202,237	167,203
Stockfish (unsalted) . . . . .	15,174	59,396
Canned . . . . .	1,444	882
Smoked . . . . .	21	19
Salted . . . . .	115,178	70,454
Reduction . . . . .	4,431	2,515
<b>Herring:</b>		
Salted . . . . .	28,834	53,469
Frozen (bait) . . . . .	9,024	15,735
Reduction . . . . .	132,631	473,240
Home Consumption (fish) . . . . .	7,015	8,549
<b>Crustaceans:</b>		
Frozen . . . . .	4,825	4,155
Canned . . . . .	113	84
Home Consumption . . . . .	3	-
Fish landed abroad . . . . .	78,367	41,625
Total . . . . .	599,297	896,526

## Decreased Exports

Exports of all types of fishery products (285,000 metric tons in 1968) were down 27% from 1967 and 44% from 1966. Export value in 1968 was US\$78.1 million, a 13% decline from 1967's US\$89.9 million. Kronur devaluation had its effect on foreign exchange earnings; kronur value of exports increased in 1968. The export decline was due to lower shipments of fish meal and oil. Most exports--43%--go to EFTA countries. The Common Market countries, the U.S., and eastern European nations each take about 16%.

## 1967 & 1968 Exports

	1968	1967
Fish Meal . . . . .	67,463	130,645
Fish Oil . . . . .	30,132	78,723
Filletts, frozen . . . . .	48,271	40,720
Salted Herring . . . . .	34,706	28,518
Other Salted Fish . . . . .	29,715	21,733
Iced Fish . . . . .	32,268	21,933

## Changes in Fleet

The purse seine fleet is growing, but the deep-sea trawler fleet is dwindling. Efforts to achieve a more profitable operation are forcing a changeover to small boats that can fish for better quality products.

## Fishing Areas

The principal fishing grounds for Iceland are her coastal waters. There are extensive shallow water areas surrounding Iceland; particularly long shelf projections radiate from the southeast and southwest coasts. Cod and other bottomfish are fished along the south and west coasts. The herring fishery centers off the north and east coasts. Normally this is a coastal fishery but, in 1967 and 1968, the herring moved from the Jan Mayan area away from Iceland, instead of towards it, as they usually do. Fishermen had to go far into the North and Norwegian Seas. Distances were so great (over 800 miles from Iceland) that carrier vessels had to be pressed into service to bring the fish from catcher vessels to the mainland. The ocean perch fishery is off the east coast of Greenland and in ICNAF subarea 3K.

## Government Assistance

Within the last year, the government has increased its share of the price equalization fund, which is designed to offset fluctuation

in export prices. It has provided money for leasing herring carrier vessels, US\$3 million to alleviate unemployment caused by declining catches, and helped processors to reorganize. Along with the November 1968 kronur devaluation, the government provided an expanded price equalization fund for exports. Although a similar proposal to establish a broadened price equalization fund for all fishery products had been passed in 1967, it was overtaken by 'forced' continuation of 1967 subsidies through 1968, and by special assistance to freezing plants. Previously, only frozen fishery exports had been covered by this fund. The devaluation rate for 1968, contrasted with 1967's, was selected after an intensive study to permit all segments of the industry to operate without deficits, or subsidies, or financial aid. The government hoped to prevent continuation of the 1967 and 1968 legislation covering a variety of subsidies.

Government fishery policy comprises reorganization of the share payment system, deducting increases in fishing vessel owners' operating costs before crew shares are paid; reliance on banks and investment funds for investment in fishery export industries (by

special subsidies and government assistance); and special legislation for vessel owners whose foreign debts have been escalated by devaluation. The fleet has been faced with higher costs in recent years, caused partly by new technological requirements, and the owners' part of income has been frozen through share-or-catch agreements. The government is attempting to correct the imbalance in the wage payment system and to lighten the owners' financial troubles.

### The Future

The most important fishery development in the future is likely to be increased emphasis on codfishing: from smaller boats (up to 200 tons), trawlers (the government will shortly bid out the construction of four 500-700-gross-ton stern trawlers), and the larger boats intended originally to catch herring. This increased emphasis is likely to result in greater price differentials between high- and low-quality fish from the vessels. This means more of the catches will be iced in boxes aboard the boats--and should prevent vessels overloading with catches that are undifferentiated in quality.

### PRIMARY SOURCES

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## LATIN AMERICA

### Chile

#### Pacific Salmon Introduced into Southern Streams

John W. DeWitt

In January 1968, about 30,000 eyed eggs of the coho salmon, *Oncorhynchus kisutch*, arrived in Chile to begin a new program for the introduction of Pacific salmon. The last liberations of salmon eggs and fry were made many years ago. Several species were stocked then, but there is no clear evidence that establishment occurred, even initially. Investigations in 1966 and 1967 failed to turn up any indication that Pacific salmon were established in Chilean waters at the time, or ever had been, contrary to some reports.

#### Many Southern Streams Suitable

In 1966, observations along nearly the entire coastline revealed hundreds of streams, apparently suited for Pacific salmon, in Chile's southern third. The fact that most, or perhaps all, of these streams have populations of rainbow, brown, or eastern brook trout attests to their general suitability for salmonids. The presence of sea-run rainbow and brown trout in some areas also indicates that the marine environment is suitable for Pacific salmon. The trout generally are underexploited, mostly because of the sparse population, and the relative inaccessibility of the streams. Establishment of Pacific salmon could produce a new and accessible coastal fishery with these largely inaccessible

streams serving as spawning and nursery grounds.

#### Washington Donated Coho Eggs

The coho eggs shipped last year were donated by the Washington State Department of Fisheries at the request of the Chilean Division of Fisheries. The eggs were incubated, and the resulting fish reared to the downstream migration (smolt) stage, in the hatchery at Rio Blanco. A Peace Corps volunteer, Harry Gibson, now is assisting with their rearing and stocking.

About 12,000 coho smolt were liberated in Estero de la Zorra, a small stream near Puerto Montt, last winter (spring in Chile). A few others were stocked in spring 1969. The stocked fish averaged about 95 mm. in length and 85 to the pound. The main results will be realized when the adult salmon return to spawn in the Chilean fall of 1970.

An additional 50,000 coho eggs donated by the Oregon State Fish Commission were shipped to the Rio Blanco hatchery in January 1969. An excellent hatch occurred and the smolt will enable the program to continue. More species, and larger numbers probably will be stocked if the initial efforts are successful.

Dr. DeWitt is Fishery Biologist, Food and Agriculture Organization, Lake Nasser Development Centre, Aswan, Egypt.



## Surinam

### SHRIMP INDUSTRY IS GROWING

A U.S. firm has purchased a controlling interest in Surinam American Industries Ltd. (SAIL), Surinam's only shrimp processing and exporting firm. The U.S. firm also acquired all outstanding stock of World Wide Marketers Ltd. of New York City, SAIL's U.S. importer and purchasing agency.

#### Stimulates Interest

This move was only one among many made recently that have given new impetus to an industry with great potential. Most Surinamers claim it has not developed as rapidly as conditions would have permitted. The exclusive processing and export rights, accorded to SAIL in 1956, will expire on Sept. 17, 1971. There is already a flurry of activity as other companies are organizing to be off and running on that date. Meanwhile, the Government of Surinam has given written assurance to officials of the U.S. firm that the change of management at SAIL will in no way affect SAIL's exclusive rights.

During April, Surinam news media reported the possible formation of as many as five new shrimp companies. At present, only two are beyond the planning stage.

#### New Processing Plant

International Fisheries of Surinam was established in early April with two Surinamers as directors. The firm's manager is to be a Japanese with some six years' experience as plant manager of a large fish-and-shrimp complex in Japan. Five Japanese trawlers have been purchased. Until 1971, catches will be delivered to SAIL for processing and export. Plans call for the acquisition of more trawlers and for the construction of a processing plant capable of handling the catches of 40-60 boats. The plant should be operational by the end of 1971.

#### Servicing Trawlers

A shrimp-boat servicing venture is also beyond the planning stage. It is headed by a large poultry producer in Surinam. A Government permit is expected momentarily for the construction of a fuel storage facility, pier, and ice plant to service trawlers based in Barbados and Trinidad. The Texas Company is to build the fuel facility and then lease it to the poultry producer, who will construct the pier and ice plant. The venture is already assured of the business of 120 trawlers that

come from Barbados and Trinidad to shrimp in the very productive waters off Surinam. The poultry producer owns a large property adjacent to his chicken-processing plant on which he plans to build a modern shrimp-processing facility.

#### Aid From Japan

Several other Surinamers have been mentioned during recent weeks as would-be organizers of shrimp companies. However, plans in every case are vague and general. Some reportedly are looking to Japan for the necessary capital and expertise.

The Japanese Ambassador to the Netherlands visited Surinam in March 1969 and promised technical assistance for the fishing industry. Shortly thereafter, the head of the Fisheries Division of the Surinam Ministry of Agriculture, Animal Husbandry and Fisheries, made a quick trip to Japan to confer with Japanese Government officials. Some 15 of the 52 shrimp trawlers now operating out of Surinam fly the Japanese flag. Of some concern to Surinamers interested in the shrimp industry are the Japanese mother-ships reportedly operating off Surinam.

#### Licenses

To prevent too great a proliferation of shrimp companies following 1971, the Fisheries Division has indicated that it will probably limit the issuance of licenses to 4 or 5. Some may be split licenses, with one firm given the right to construct a processing plant, another an ice plant, another the maintenance of a shrimp fleet, etc.

#### SAIL's Processing Facilities

The SAIL's present facilities are among the best to be found anywhere. Officials of the U.S. firm have indicated that they will expand the plant's capacity. It now has two blast freezers capable of freezing 55,000 pounds of shrimp a day. Cold-storage facilities can accommodate 500,000 pounds at once, and four ice plants have a daily output of 100 tons.

#### Shrimp Fleet

Expansion of processing capacity should mean a corresponding increase in the Surinam-based shrimp fleet. Presumably these vessels will come from either the U.S. or Japan. Of the 52 trawlers that currently claim Paramaribo as home port, 30 fly the U.S. flag; 15 the Japanese; and 7 the Surinam. Among the latter are the 5 trawlers recently acquired by International Fisheries of Surinam.

## Surinam (Contd.):

## Exports

Exports until now have generally shown a healthy buildup from year to year. They should increase even more markedly during the period immediately ahead, with most going

Shrimp Exports		
	1967	Jan.-Sept. 1968
	... (1,000 Lbs.) ...	
Total .....	2,350	2,584
To U.S. ....	1,838	2,346

to the U.S. During the first nine months of 1968, exports surpassed the total for the full twelve months of 1967. (U.S. Consulate, Paramaribo, May 19.)



## Mexico

## SHRIMP PRODUCTION DECLINES

Due to reduced early season catch, Mexico's 1969 shrimp production is unlikely to show much improvement over 1968. As market prices are expected to be strong, an estimated 5% increase in overall value could result. Total volume of Mexican shrimp catches for 1968 was about 36,000 metric tons. This was 6.7% of a total fishery production of 240,071 tons.

Other food fish and shellfish should hold their own with last year. Industrial products are expected to increase about 10% in value. Considering the total value of all segments of the fishing industry, a net growth of about 6% is expected in 1969, compared with a decline of 6% in 1968. (Reg. Fish. Attaché, U.S. Embassy, Mexico, May 27.)



## Peru

FISH MEAL OUTPUT & EXPORTS  
DECLINE SLIGHTLY IN JAN.-APR. 1969

During Jan.-Apr. 1969, Peru's production and exports of fish meal fell off a little from the same period in 1968.

	1969	1968	1967
	..... (Metric Tons). ....		
<b>Fish meal production:</b>			
Jan. ....	240,495	284,021	287,466
Feb. ....	17,357	191,575	109,644
Mar. ....	325,549	155,233	163,512
Apr. ....	240,763	212,954	226,047
Total .....	824,164	842,883	786,669
<b>Fish meal exports:</b>			
Jan. ....	140,283	192,056	100,281
Feb. ....	185,938	188,222	115,673
Mar. ....	188,225	170,107	117,282
Apr. ....	195,925	167,027	118,458
Total .....	710,371	717,412	451,694
Stocks on hand Apr. 30	490,116	712,506	701,508

## April Set Records

April figures set new production and export records for that month. Stocks on hand April 30 were the lowest for that date in 4 years.

Prices for fish meal reached US\$171 per metric ton c. & f. Hamburg in May; prices for deliveries later in the year were somewhat lower.

The 1968/69 anchovy season closed May 31 and will reopen September 1.



## Brazil

TERRITORIAL SEA  
EXTENDED TO 12 MILES

On April 28, 1969, Brazil extended her territorial sea to 12 nautical miles, measured from the sinuosities of the coastline at mean low water. Brazil previously claimed a 6-mile territorial sea and a contiguous fisheries zone between 6 and 12 miles from shore. No plans are known for greater claims of territorial sea or fisheries jurisdiction.

Brazil is party to none of the Geneva Conventions on the Law of the Sea, but she has adopted domestic legislation closely paralleling the Convention on the Continental Shelf. (U.S. Embassy, Rio de Janeiro, Apr. 29, and other sources.)

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## ASIA

### Japan

#### FISHERY CATCH SET RECORD IN 1968

The fishery catch (excluding whales) reached a record 8,553,000 metric tons in 1968. This was 9% over 1967's 7,851,000 tons--and exceeded 8 million tons for the first time. The high was attributed to increased landings from the distant-water trawl and off-shore fisheries. These rose 17% and 12% over 1967.

1968 Tuna Catch (Includes Billfishes)		
Type of Fishery	1968	1967
	.. (Metric Tons) ..	
Distant-water long line . . . . .	339,000	354,000
Distant-water pole-and-line skipjack	126,000	142,000
Coastal pole-and-line skipjack . . .	70,000	78,000
Coastal tuna long line . . . . .	77,000	75,000

#### Species

The high catch of Alaska pollock (used for minced fish) in the Okhotsk Sea, Bering Sea, and the North Pacific was particularly noteworthy. Mackerel and squid landings also were good. The 1968 tuna catch declined somewhat from 1967. Government statistics on catches by species should be published in August. ('Suisan Tsushin,' May 2.)

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#### SALMON PRICES SET FOR 1969

The Japan National Federation of Salmon Fishermen's Cooperative Associations (representing catcher vessel owners) has agreed with Northern Waters Salmon Mothership Council on 1969 prices for fresh whole Pacific salmon delivered by catcher vessels to mother-ships.

The increase--about  $\frac{1}{2}$  U.S. cent a pound for red salmon--is small, but represents a

Salmon Delivery Prices		
	1969 Prices	1968 Prices
	.. (U.S. Cents/Lb.) ..	
Red . . . . .	31.3	30.7
Chum . . . . .	24.5	20.2
Pink . . . . .	15.7	14.9
Silver . . . . .	25.9	21.0
King . . . . .	25.9	21.0

recovery to the 1967 level. In 1968, the price for reds had declined because of the adverse effect of the British pound devaluation on Japanese canned red salmon exports to pound sterling areas.

Greater price increases for other species were accepted by the mothership firms because of good domestic prices for frozen chums and silvers. ('Suisan Tsushin,' May 9.)

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#### CANNED TUNA PRODUCTION DROPPED IN 1968

Japanese canned tuna production by Canned Tuna Packers Assoc. members during business year (BY) 1968 (Apr. 1968-Mar. 1969) was 5,051,366 standard cases (48 7-oz. cans). This was about 770,000 cases below previous year's 5,820,662 cases.

The sharp reduction is attributed to: 1) decline in canned light-meat production because of poor skipjack fishing; 2) reduced canned

Table 1 - Canned Tuna Production, BY 1968 and 1967

Kind of Pack	Quantity	
	BY 1968	BY 1967
. (No. Standard Cases 1/).		
<u>Canned tuna in brine:</u>		
For U.S. - white meat . . . . .	1,728,295	2,082,602
" " - light meat . . . . .	515,216	488,007
Total . . . . .	2,243,511	2,570,609
For other countries - white meat . .	4,404	5,403
" " " - light meat . . . . .	29,359	23,571
Total . . . . .	33,763	28,974
Canned tuna in oil . . . . .	1,584,842	2,236,652
Specialty pack 2/ . . . . .	1,189,250	984,427
Total pack of canned white meat . .	2,091,404	2,497,999
Total pack of canned light meat . .	2,959,962	3,322,663
Grand Total . . . . .	5,051,366	5,820,662
1/48 7-oz. cases.		
2/Over 90% consisted of canned tuna with vegetables and seasoning.		

Table 2 - Canned Tuna in Oil Production, BY 1968

Species	Quantity	
	BY 1968	BY 1967
.. (No. Actual Cases) ..		
Albacore . . . . .	380,709	429,991
Yellowfin . . . . .	21,115	13,944
Big-eyed . . . . .	447,314	550,750
Skipjack . . . . .	1,136,465	1,832,402
Total . . . . .	1,985,603	2,827,087

## Japan (Contd.):

whitemeat production, down about 400,000 cases below production target, because of high albacore prices.

Production of specialty packs rose 20,000 cases. Canned tuna in brine for export to the U.S. packed by so-called "outsiders" totaled 99,839 cases. "Outsiders" do not belong to Association. ('Suisan Tsushin,' May 20.)

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## SEEK CAUSE FOR POOR TUNA SEINING IN E. PACIFIC

Yellowfin tuna catches in the eastern Pacific regulatory area during the first three months of 1969 totaled 1,469 metric tons. Longline catches, generally good, far exceeded 1968 catches for the same period, but purse-seine fishing was poor. ('Katsuo-maguro Tsushin,' Apr. 30.)

Owners of the 4 Japanese seiners that fished yellowfin tuna in the eastern Pacific regulatory area this year are studying the cause of their disappointing performance compared with U.S. seiners. The seiners left the area after harvesting a total of only about 380 metric tons of yellowfin and skipjack in 2 months. Two of the seiners returned to Japan to enter the purse-seine fishery off Japan. The other two left for the eastern Atlantic to fish yellowfin off west Africa.

## The Catch

'Hayabusa Maru' (275 gross tons) caught about 60 tons, 'Nissho Maru' (252 gross tons) 40 tons, 'Hakuryu Maru No. 55' (500 gross tons) 150 tons, and 'Gempuku Maru No. 82' (500 gross tons) 130 tons. The owners attribute the poor performance primarily to unfamiliarity with the fishing grounds--but also to unsatisfactory gear and inadequate knowledge of U.S. purse-seining methods.

## Speed-Boat Technique

U.S. seiners use speed boats to encircle fish schools. One seiner may carry 4-5 speed boats. The boats are about 6½ feet long, powered with 100-hp. outboard motors capable of 40 knots. The fishermen use the boats to bring the yellowfin together, like cowboys herding cattle. Since herded yellowfin form into a tight school, they can be captured with a small net.

In contrast, Japanese seiners do not have speed boats, and must use larger nets to surround scattered schools. Some Japanese feel that without speed boats, it may be difficult to make good catches. In view of reports of yellowfin abundance in the eastern Pacific, Japanese purse-seine operators believe that in 2 or 3 years they can overcome the problem of poor fishing experienced this year.

In 1970, Japan-based seiners are scheduled to leave port in late November. Those fishing off west Africa plan to depart in time to arrive in eastern Pacific by Jan. 1--the opening date for yellowfin fishing. ('Minato Shimbun,' May 21, 'Shin Suisan Shimbun,' May 12.)

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## ATLANTIC-CAUGHT ALBACORE EXPORT PRICES ROSE IN MAY

Owing to poor fishing, prices for Japanese Atlantic-caught albacore exports to Puerto Rico have been rising. As of mid-May 1969, they were quoted at c. & f. US\$500, and as high as \$510, a short ton for fish over 40 pounds. In the Atlantic, southwest of Bermuda Island and off Rio de Janeiro, the Japanese were taking albacore mixed with big-eyed and yellowfin.

## Indian Ocean Albacore

In the Indian Ocean between Durban, South Africa, and Madagascar, albacore fishing was picking up. Many vessels reported over 3 tons of catch a day. Fishing conditions there are likely to affect the albacore export prices considerably. ('Suisan Tsushin,' May 18.)

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## REORGANIZES EASTERN ATLANTIC PURSE-SEINE FLEET

The Nichiro Fishing Co., tuna seining off west Africa, plans to reorganize that operation due to vessel withdrawals. Until early 1969, the fleet consisted of 2 motherships and 7 purse seiners; in 1968, these had fished profitably for the first time in 4 years. However, early this year, 2 of its large, independently operated, seiners--'Hakuryu Maru No. 55' and 'Gempuku Maru No. 82,' each 500 gross tons--went to the eastern Pacific to fish for yellowfin. Two others withdrew because of poor fishing.

Japan (Contd.):

#### Replacements Planned

Nichiro is seeking permission from the Fisheries Agency to assign to the fleet more seiners of 500- to 600-ton size. It would send these to the eastern Pacific during the slow season off west Africa. ('Shin Suisan Shim-bun,' May 19.)

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#### SUMMER ALBACORE FISHERY IMPROVES, PRICES HIGH

In early May, the pole-and-line summer albacore tuna fishery was extremely slow. Landings at Yaizu and Shimizu averaged 50-100 tons a day. Some observers attributed the poor fishing to a cold-water mass in the Sea of Enshu. Exvessel prices for pole-caught albacore ranged from US\$484 to 532 a short ton. Domestic cannery prices were paying around \$504 a ton. They have difficulty operating economically at the price. ('Suisan Tsushin,' May 13.)

#### Slow Through Mid-May

Partly due to the cold-water mass off the home islands, the summer albacore tuna fishery continued slow through mid-May. In late April, 154 pole-and-line vessels were fishing albacore off Japan. April 1-May 16 landings at Yaizu were 3,130 metric tons, compared with 5,000 tons for same period 1968. The lag in landings pushed exvessel prices to about US\$529 a short ton. The scarcity also sent up export prices. Direct exports to the U.S. were quoted at c.& f. \$545 a short ton on May 20. ('Suisancho Nippo,' May 21.)

#### Yaizu in May

May 1969 landings at Yaizu were 14,945 metric tons valued at about US\$7.45 million. Compared with May 1968, this was a decrease in quantity of 1,338 tons, or 8%, but an increase in value of \$621,000, or 9%. The decrease in quantity was due primarily to a decline in southern bluefin tuna landings and to poor pole-and-line skipjack catches. The short supply of southern bluefin and skipjack drove up prices sharply compared with a year ago.

However, albacore landings were 2,500 tons above the same month last year due to

the sharp improvement in the summer albacore fishery from the latter part of May. ('Nihon Suisan Shim-bun,' June 11.)

#### Improves in Late May

The fishery began improving from around May 20; landings at Yaizu were 400 to 800 metric tons a day. May landings at Yaizu, Shimizu, and Numazu totaled 8,300 tons. While this does not compare with the 15,000 tons landed at these ports in May 1965 (an excellent catch year), they were far ahead of the past 15-year average of 5,400 tons for the same month. The fishermen are hopeful that, with continued good fishing, this year's supply will be the highest since 1965, when the season's catch totaled 36,000 tons.

#### Cold-Water Mass Bypassed

The improvement in fishing was attributed to the landward movement of the Kuroshio current bypassing the cold-water mass. This produced a good run near the home islands, where even small boats could engage in the fishery. In addition, sizable albacore concentrations were encountered farther offshore in scattered waters near 32° N. latitude and 144°-155° E. longitude.

#### Prices

Exvessel prices at Yaizu for pole-caught albacore were around US\$479-492 a short ton in late May. Even damaged fish sold around \$454 a ton. Cost calculations are based on the current f.o.b. Japan price of \$11.80 a case (7-oz., 48's) for canned whitemeat tuna exports to the U.S. These calculations show that raw albacore prices would have to be around \$454 a ton for packers to make a profit. Those who pay more are losing money.

#### Packers Wary

Despite forecasts that June landings would reach 10,000 tons and that this season's total landings would likely surpass 20,000 tons, the packers do not think that present good fishing will continue long--judging from the fish size and meat condition. Therefore, they want to stock up as much canned tuna as they can before the peach-packing season begins in mid-July. Thus, stimulated by a strong demand, the albacore price in Japan continues high, particularly since domestic packers have not been able to obtain much skipjack this year because of poor fishing. In recent months,

## Japan (Contd.):

they have been operating only from day to day and have no cold storage inventory.

## Export Pack

To meet production requirements for canned tuna exports to the U.S. and Europe, as well as to supply the growing domestic demand for tuna packed in oil, it is estimated that Japanese packers will have to pack at least 2 million cases of whitemeat tuna this year. Assuming that it takes 35-40 pounds of raw albacore to pack one case of whitemeat tuna, the packers would need a minimum of 34,000 metric tons of albacore. Even if the summer pole-and-line fishery supplies 20-30,000 tons of albacore this season, the packers may still not be able to buy the fish at as low a price as they would like to pay. The present high-price level has become the norm, and packers will have to streamline operations and improve organizational structures. ('Suisan Keizai Shimbun,' June 10.)

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## SOUTHERN BLUEFIN FISHERY DEVELOPMENTS

Because southern bluefin tuna are less abundant in the Tasman Sea off southeast Australia, about 200 Japanese longliners have shifted to other grounds. About 50 are fishing for bluefin off New Zealand's southeastern coast. Despite declining bluefin catch in that region, which was averaging 0.8 ton per vessel per day, those vessels continue to concentrate on that species because of high price in Japan. The vessels are equipped with extra-low temperature freezer units and modern labor-saving devices.

Other vessels have shifted to Banda Sea and northwestern Indian Ocean seeking big-eyed tuna. ('Suisan Keizai Shimbun,' May 28.)

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## KING CRABBING IN BERING SEA

In mid-May 1969, the 2 Japanese crab factoryships 'Keiko Maru' (7,536 gross tons) and 'Koyo Maru' (7,658 gross tons) licensed for 1969 eastern Bering Sea crab fishery were taking king crab and tanner crab.

The Keiko Maru fleet (operated jointly by Nihon Suisan, Hokujo Suisan, Hokoku Suisan, and Kyokuyo Hoge) began fishing Mar. 12. It was assigned a production quota of 43,404 cases (48  $\frac{1}{2}$ -lb. cans) of king crab and 8.6 million tanner crab (including a 5% allowance). The fleet was not doing well in the king-crab fishery. It was concentrating on pot fishing for tanner crab.

## Koyo Maru Fleet

The Koyo Maru fleet (Taiyo, Nichiro, Hokkaido Gyogyo Kosha, Hoko Suisan, and Kokusai Gyogyo) commenced fishing Mar. 15. Its production quota was 41,596 cases (48  $\frac{1}{2}$ -lb. cans) of king crab and 8.2 million tanner crab (including a 5% allowance). It was making relatively good catches of king crab; tanner crab pot fishing was also satisfactory.

## Tanner Crabs Good

The tanner crabs are large and good quality. If their present high price in Japan stays ahead of high processing and transportation costs, the 2 fleets may not suffer as severely from the sharply reduced 1969 king crab quotas as feared. ('Nihon Suisan Shimbun,' May 19.)

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## SEEK SAURY IN EASTERN PACIFIC

The fishery firm Nippon Suisan is planning experimental mothership-type saury fishing (night fishing with lights) in the eastern Pacific, August to December 1969. The firm will send one 539-gross-ton trawler as a mothership, and one or two 100-gross-ton trawlers, to the area east of 170° E. longitude, toward the California coast. It will be the first distant-water saury fishing expedition undertaken by any Japanese fishery firm. ('Rafu Shimpō,' June 4.)

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## MORE SHELLFISH CULTURE SEABED AREAS ARE DEVELOPED

The Hokkaido Prefectural Fisheries Department and the Japan Land Development Co. are planning to sample shellfish cultures by plowing the bottom with a specially designed marine bulldozer.

## Japan (Contd.):

The Japan Land Development Co. developed the prototype "marine bulldozer" for about US\$60,000 and tested it in October 1968. It can operate at a depth of 5 meters and will be completed in July 1969. Company researchers will cooperate with engineers of the Hitachi Works to develop a new model by summer 1970 capable of operating at 20 meters. The "bulldozer" is operated from a mothership using 4 cables.

If the marine bulldozer proves efficient, the Fisheries Department will attempt to cultivate shellfish at points along the Hokkaido coast previously considered too rocky to use. (U.S. Consul, Sapporo, May 15.)

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MAY BUILD TUNA  
SEINE/POLE FISHING VESSEL

Two fishery firms, Nichiro Gyogyo and Showa Gyogyo, may build a combination purse seine/pole-and-line tuna vessel. It would be the first of its kind in Japan. The vessel will be 350 gross tons, or possibly 500 tons, depending on policy the Fisheries Agency may adopt for such a vessel. The two firms plan to operate the combination seiner on a year-round basis. It will alternate between the eastern Atlantic off west Africa and the eastern Pacific. Their idea is to build a vessel that can either seine or pole fish, depending on fishing conditions. They hope to reduce the problem of uneven fishing previously experienced by Japanese seiners.

## Fisheries Agency Policy

However, operation of such a vessel presents a problem for the Fisheries Agency. The Agency's original policy was against increasing scale of experimental purse seining off West Africa beyond present level. Feeling that other firms may also want to build combination seiners, if they can achieve greater efficiency, the Agency plans to study immediately the effect this would have in Japan and abroad. They are particularly concerned because of the world trend toward restricting tuna catches. ('Shin Suisan Shimbun Sokuho,' May 22.)

\* \* \*

SHRIMP VENTURE  
IN INDONESIA PLANNED

The Japanese trading firm Toyomenka is scheduled to establish a local corporation in Jakarta to fish shrimp. Toyomenka recently completed one year's experimental shrimp-ing in Indonesian waters with 3 trawlers owned by Kyokuyo Hogeï Fishing Co.

The corporation--Tomen Public Fishing Company Industry--will be formed with total capital of US\$27 million. This will be fully invested in 10 years (\$10 million the first year). It will operate about 10 native vessels and 6-8 Japanese shrimp trawlers southwest of Borneo. Production is expected to total \$1.7-1.9 million annually.

## Toyomenka-Indonesia Agreement

Toyomenka agreed provisionally with Indonesia in August 1968 to invest 100%. The condition was that on the 10th year it will sell to Indonesia 49% of corporation's shares and, on 16th year, up to 52%.

## The Plans

Plans call for establishment of 5 shrimp-fishing bases, and construction of cold storages, processing plants, net manufacturing plants, radio station for fishing vessels, fuel and water supply facilities, and operation of a training center for fishery technicians. Also, 12 vessels (ten 75 feet and 2 carriers) will be built for corporation. All projects are to be completed in 10 years. To maintain these facilities, company reportedly would have to produce annually at least \$2.8 million worth of shrimp. ('Minato Shimbun,' May 8.)



## India

## SHRIMP TRENDS

India's seafood industry seems to be prosperous. It has enjoyed steady growth from the very beginning. The number of plants, exporters, and foreign buyers has increased. However, seafood exports are shrimp. Take away shrimp--and very little remains.

Total exports have been increasing yearly. But this does not mean that shrimp availability

## India (Contd.):

is no problem. An analysis of exports by sizes from Cochin 1965-1968 reveals no shortage of shrimp. Exports of sizes under 15 count to 26/30 count have gone up. However, this is no indication that catches of the large sizes off Kerala have increased.

## Shrimp Brought to Cochin

In earlier years, shrimp from distant places could not be brought to Cochin for processing; now, without any loss, shrimp can be collected, preserved, and brought to Cochin for processing. The increase in export of larger sizes from Cochin may be due to this development.

## Kerala vs. Other Areas

Kerala landings have not shown any consistent increase compared to landings elsewhere. In other areas, landings have gone up according to fishing effort; in Kerala, the landings have declined in relation to fishing effort.

In 1957, a few mechanized boats landed 7,400 tons, mainly in Kerala. In 1967, with over 2,000 shrimp trawlers, Kerala landings increased to only 27,000 tons. The facts suggest a real threat to the existence of the Penaeid shrimp in Kerala waters.

Kerala's & India's Landings of Penaeid Shrimp, 1967-1960			
	Kerala	India	Other-than-Kerala Catches
	..... (1,000 Metric Tons) .....		
1967	27	62	35
1966	28	56	28
1965	14	38	24
1964	35	63	28
1963	21	41	20
1962	29	48	19
1961	20	39	19
1960	12	31	19

The average catch-per-hour of a boat trawling in Kerala waters has decreased year after year. Fishing effort has increased tremendously, but return per-unit-of-catch-fishing effort has dropped considerably.

## Future of Prawns

Is there depletion of prawns off Kerala? Nobody knows. Some experts believe yes; others, no. Nobody has studied exhaustively the biological aspects of shrimp--breeding habits, seasonal movements, growth, and death. ('Seafood Export Journal,' April.)



## MID EAST

## South Yemen

## OFFERS POTENTIAL FISHERIES INVESTMENT OPPORTUNITIES

The Gulf of Aden and the adjacent Indian Ocean, considered one of the most productive fishing areas of the world, have been largely unexploited. A substantial change is expected in the next 12 months.

The UN Special Fund is undertaking a survey and training project in the area, and the Soviet Union is showing interest in those waters.

In May South Yemeni officials agreed to permit a U.S. firm to buy and freeze spiny lobster tails from the coast of the Fifth and Sixth Provinces. The large Kuwait-owned Gulf Fisheries has proposed a large-scale fisheries project to South Yemen, but to date no agreement has been reached. Japanese, Spanish, and Italian fishing circles also have shown their interest. (U.S. Embassy, Aden, June 4.)



## SOUTH PACIFIC

## American Samoa

## TUNA PRICES UP IN JUNE

Japanese suppliers and U.S. packers in American Samoa have agreed to a \$5-a-ton increase for albacore and yellowfin tuna deliveries in June 1969. The prices a short ton are: round albacore: frozen \$425, iced \$410; g. & g. yellowfin: frozen \$342.50, iced \$322. The prices are an all-time high for the island.

With the good albacore season approaching in the South Pacific, the number of Japanese vessels based at American Samoa is expected to increase. There were 105 long liners working out of that base in June, including 9 Japanese, 41 Taiwanese, and 55 South Korean. ('Katsuo-maguro Tsushin,' June 10.)



## AFRICA

### South & South-West Africa

#### FISHING INDUSTRY DEVELOPMENTS

South Africa's 1968 catch was 1,190,000 short tons (preliminary figure), compared to 948,170 tons in 1967. Increased catch from the 2 South African licensed factoryships more than offset lower catches from the rest of the fleet.

South-West Africa's catch rose to 1,078,900 tons, up from 784,000 tons in 1967. The increase resulted from the granting of 2 additional full pilchard licenses. Each license holder was given a small anchovy quota as well.

#### Pelagic or Shoal Fishery

The most significant development in 1968 was the record 1,780,000 ton shoal fish catch, primarily pilchards, in waters off South-West Africa. (Figures are for the pelagic or shoal catch in South and South-West African waters, rather than where the fish were landed. Factoryship catches have been combined with the South-West African catch.)

After a decade of carefully controlled expansion, the catch was permitted to more than double within 3 years. The sharp increase and the factoryship operation has divided the industry into two opposing factions, more or less divided along the lines of those who have an interest in the ships and those who do not. A number of scientists and South-West African administrators and business men tend to side with the latter. The principal issue is the threat to the pilchard resource from possible overfishing.

#### Factoryships

The factoryships had a most successful year, processing 615,000 tons of fish into 157,554 short tons of fish meal and 39,629 long tons of fish oil. The meal probably sold for at least \$100 per ton, f.o.b.

The 'Suiderkruis,' after correcting some problems that had plagued her in 1967, reportedly took two-thirds of the total. The 'Willem Barendsz' took a little over 2 weeks for each trip from the fishing grounds to Cape Town to discharge her meal and oil. Suider-

kruis transshipped her production directly to a carrier vessel in Walvis Bay harbor, taking about 2 days for the operation. At the end of 1968, Barendsz' equipment was modified to permit pelletization of meal. Attempts by South-West Africa to patrol catcher vessels from the factoryship fleets were generally ineffective.

#### Exports

Exports of fish meal and fish oil reached record proportions in 1968: 402,876 short tons of meal, and 107,167 long tons of oil.

Canned pilchard pack for cat food, tested in the U.S. market, proved very successful. As a result, over a million cases are expected to be exported to the U.S. in 1969, and more than 2 million in 1970.

#### Spiny Lobster Fishery

The spiny lobster industry continued to deteriorate in 1968, despite the apparent recovery in South-West Africa's landings.

South Africa: In April 1969, the Commission of Inquiry into the South African Fisheries suspended other activities and concentrated on the lobster industry. The South African export quota had not been reached since 1961, landings had dropped from 12,701 tons (live weight) in 1965 to about 7,000 tons in 1968, and the 1969 season was poor. Between 1964 and 1968, frozen lobster tail exports decreased from 339,643 cases (20 lbs. each) to 203,490 cases.

South-West Africa: Spiny lobster landings were about 9,500 tons (live weight), compared with 5,889 tons in 1967. Two factors accounted for the sharp rise: (1) the 1967 season had been especially poor, due in part to inclement weather, and (2) size restrictions had been eliminated at the beginning of 1968. The fishermen filled the export quota and took the permissible 15% of the 1969 quota as well. However, the catch was largely small-size lobster.

#### Hake Fishery

South Africa: Hake landings were 87,000 tons (headed and gutted fish), about the same as in 1967. The 'Harvest Sun,' a 171-ft., 600-gross ton, freezer stern trawler ordered by

### South and South-West Africa (Contd.):

the Sea Harvest Corporation, was launched at Durban. Irvin & Johnson (I&J) ordered a prototype stern trawler from a British firm; 6 of this class have been tentatively ordered from South African yards.

**South-West Africa:** The South-West African administration continued to press white-fish processors at Walvis Bay to combine and form a consortium that could compete effectively both on the fishing grounds and in the marketplace. A full pilchard quota was awarded to the proposed consortium. Profits from this valuable asset would supply the consortium with the needed capital. After considerable discussion about division or ownership, agreement seemed near in first-half 1969. Work on the consortium's reduction facilities was almost completed, and production of meal and oil was expected to begin in mid-1969.

### Quality Controls

Quality-control proposals have been drawn up by the South African Bureau of Standards. They provide for compulsory standard specifications for frozen fish, frozen marine molluscs, and their products, and for frozen spiny lobster products. It was expected that the proposals would take effect around the beginning of 1970. Revised compulsory standards for canned fish and shellfish were published March 29, 1969. They became effective two months later.

### Shrimp Fishery

The South African shrimp fishery continued to falter in 1968. Poor fishing and accidents plagued the Saldanha-Durban operation. That company ceased shrimping activity during the first half of 1969, leaving only one company in the fishery. I&J sent one of its trawlers to do some experimental shrimping in waters off the Angolan coast in early 1969.

### Change in Administration

In April 1969, administration over the South-West African fisheries passed to South Africa. The South African Division of Sea Fisheries was given control over South-West African fishery research activity. (Regional Fisheries Attache, U.S. Embassy, Abidjan, June 7.) Important benefits are expected to flow from the change in control. They include

joint coordinated research in the waters off South and South-West Africa, and better deployment of patrol boats and research vessels. General policy of fisheries administration--and functions concerning legislation and procedures--will be correlated with a view to rationalizing control. The change also will facilitate discussion of matters of common concern with boat owners and with the industry. ('South African Shipping News and Fishing Industry Review,' May.)



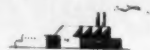
## Senegal

### NEW SEAFOOD PLANT OPENS

June 6, 1969, marked the formal opening of the new US\$390,000 frozen seafood processing plant of the Société Sénégalaise de Produits Alimentaires Congelés (S.P.A.C.). Annual production capacity of the new plant is 2,000 metric tons--1,400 tons of shrimp and spiny lobster, 350 tons of fillet of sole, and 250 tons of other fish. By 1972, production is expected to increase to 3,000 tons providing sales of \$5,650,000. Virtually all the present production is exported to Europe. However, the company plans to enter the U.S. and Japanese markets in the future.

### French Investment

The new plant is part of the French-owned Amerger group. It will bring Amerger's total investment in Senegalese fish plants to about \$1,000,000. This includes factories in Kaolack (Amerger Sine-Saloum, \$100,800) and Ziguinchor (Amerger Casamance, \$484,000). (U.S. Embassy, Dakar, June 11.)



## Zambia

### LAKE TANGANYIKA FISHERIES TO BE DEVELOPED

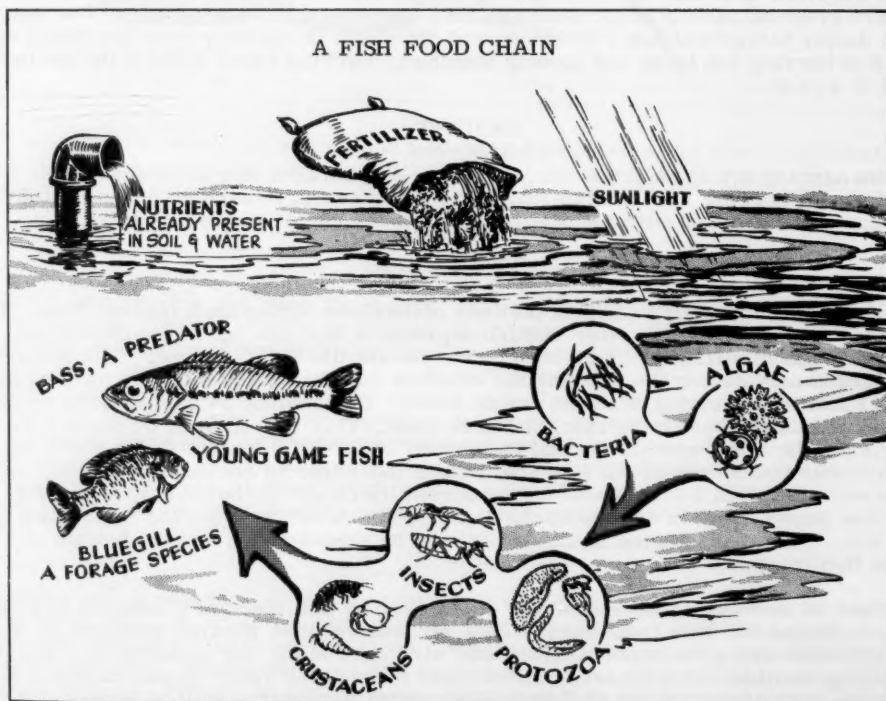
Zambia's Industrial Corporation (INDECO) was slated to make an initial investment of about US\$1.8 million to develop the fishing industry on Lake Tanganyika. Development will be carried out by Lake Fisheries of Zambia Ltd. INDECO holds an 83% interest in Lake Fisheries and a Norwegian firm 15%.

## Zambia (Contd.):

## The New Company

The new company has acquired all assets, including a factory and boats, of a foreign company that operated on the lake. Lake Fisheries will buy new trawlers, bigger nets, and 25 refrigerated trucks, and install a new

fish-processing plant and distribution warehouse. The marketed tonnage of fish from the lake was expected to rise from about 3 to 20 tons daily by July 1969. ('International Financial News Survey,' May 30, from 'African Development,' Mar.)



## FOOD FISH FACTS



MAINE SARDINES  
(Atlantic herring)

(*Clupea harengus*)

What is a sardine? The word sardine is not the name of just one species of fish but rather a collective name that represents a variety of tiny, soft-boned fish. The name sardine probably comes from the fact that similar, tiny fish, called French sardines, were first found and caught in great abundance around the island of Sardinia in the Mediterranean. The Maine sardine is a member of the Atlantic herring family. Caught and enjoyed by Atlantic coastal Indians long before the first settlers arrived, these tasty little fish are still being caught in the same coves and inlets used by the Indians of long ago.

## DESCRIPTION

Maine sardines are the immature young of the Atlantic herring which has an elongated body and are greenish blue in color with a silvery cast on the sides and belly. The tail of the herring is deeply forked and has a single dorsal fin which is directly over the small ventral fin. Scales of herring are large and loosely attached. Herring reach about 4 inches in length by the end of a year.

## HABITAT

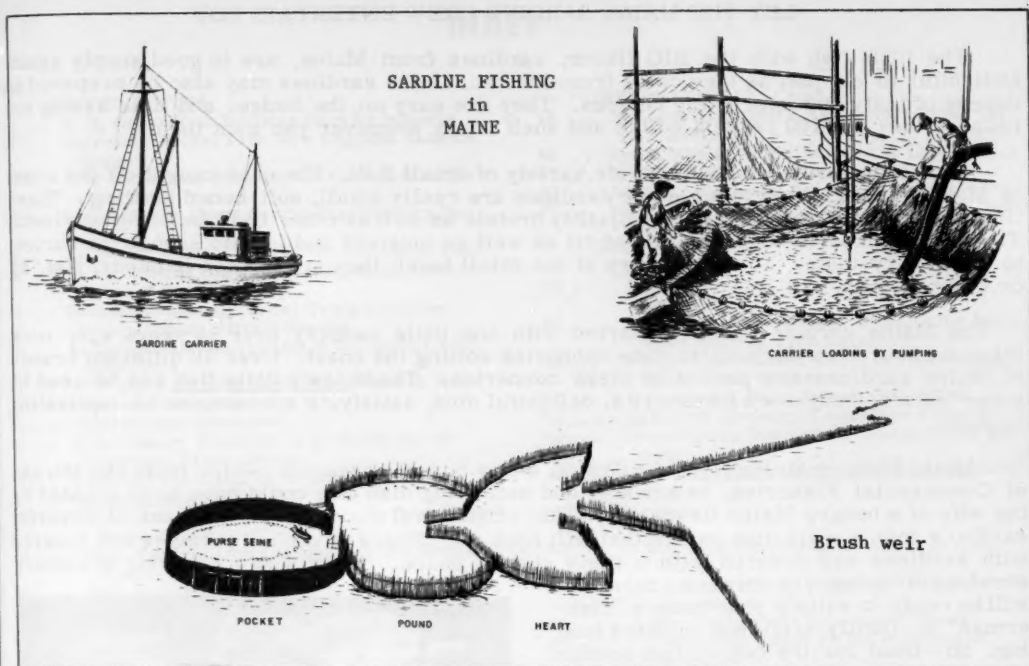
Atlantic herring are found from Virginia north to Labrador and Greenland. The largest number of small herring or sardines caught by commercial fishermen of the United States are found north of Cape Cod with the Maine coastline the center of the industry.

## SARDINE FISHING

Sardines are most easily caught in the dark of the moon during their feeding time. Sometimes their movements in the water disturb organisms that give off a phosphorescent light, similar to the light of a firefly. This light makes the sardines easy to see. This phenomena, however, occurs only during the mid and late summer months. Many methods have been used in catching sardines beginning with the brush weirs. This method is said to have originated with the early Indian tribes living along the east coast. This is still used by some fishermen especially when the tides are strong and the waters shallow. It consists of a stationary fish trap which blocks the course of the fish and funnels them into an enclosure. Another method is the stop seine which is a long net stretched across the mouth of the cove after the fish have entered. The purse seine is a more up-to-date method which enables the fishermen to fish in deeper water. The purse seine is circled around the school of fish and the bottom is closed keeping the fish trapped.

A method of harvesting developed by the Bureau of Commercial Fisheries has been of great help to Maine sardine fishermen. This air-bubble hose method consists of a hose pierced with holes along the upper surface and stretched along the ocean bottom around an area containing sardines. Compressed air pumped through the hose causes bubbles to rise to the surface and, since the small fish will not swim through the wall of bubbles, they are trapped.

(Continued following page.)



The use of otter trawls on bottom and midwater fishing areas is also being used. Methods used to find the schools of sardines include aerial spotters, depth recorders, and sounding devices such as sonar.

### CONSERVATION

Scientists of the BCF Biological Laboratory in Boothbay Harbor, Maine, have been doing research on herring for the past 20 years. Their research includes all stages of the life history of herring. This research is divided into three parts: (1) all phases from hatching through larval development and up to the time the fish completes its first year of life; (2) the sardine program which concentrates on inshore fish from 1 to 3 years old; and (3) the adult herring program which studies coastal spawners as well as the offshore populations of Georges Bank. Through the third part of the research, scientists have shown that the offshore herring stocks are independent of those fished in coastal waters. This information is vitally important to the Maine sardine industry and may encourage greater exploitation of the offshore herring stocks by other segments of the United States fishing industry. All fishery research has a basic goal to ensure the wise use of a renewable resource.

### USES OF SARDINES

Sardines are a valuable source of high quality protein which is needed for building and repairing body tissues. They contain calcium and phosphorus needed for strong bones and teeth and iron needed for healthy, red blood. Sardines provide useful amounts of thiamine, niacin, and riboflavin. Maine sardines are packed in various types of oil as well as mustard and tomato sauces. Packed in flat 4-ounce cans, they are ready to eat at the zip of a can opener, a pull tab, or a key. (Source: National Marketing Services Office, BCF, U.S. Dept. of the Interior, 100 East Ohio, Rm. 526, Chicago, Ill. 60611.)

(Recipe following page.)

## LET THE MAINE SARDINE CREW ENTERTAIN YOU

The little fish with the **BIG** flavor, sardines from Maine, are in good supply again. Delightful to eat just as they come from the can, Maine sardines may also be prepared in dozens of tasty and interesting recipes. They are easy on the budget and time saving too because they are 100 percent edible and shelf ready whenever you want them.

The term sardine covers a wide variety of small fish. The ones caught off the coast of Maine and referred to as Maine sardines are really small, soft-boned herring. These tiny fish provide concentrated high-quality protein as well as other body-building nutrients. They are packed in several types of oil as well as mustard and tomato sauces--a variety to suit every taste. For consumers at the retail level, they are packed in handy, flat, 3½ or 4-ounce cans.

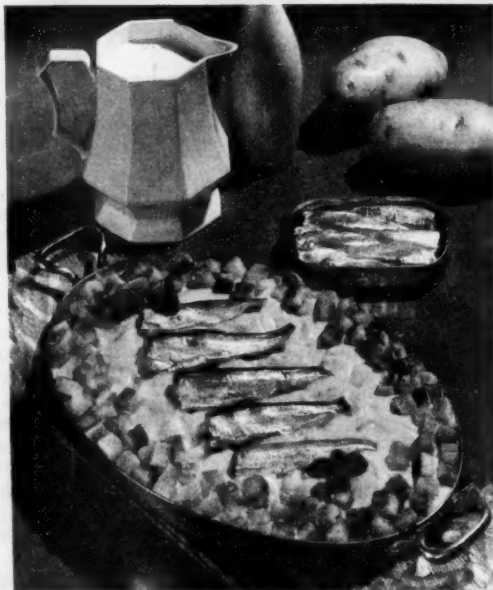
The Maine sardine industry started with one little cannery over 80 years ago; now there are over 30 modern, up-to-date canneries dotting the coast. Over 60 different brands of Maine sardines are packed in these canneries. These **tasty little fish** can be used in super salads, budget casseroles, delightful dips, satisfying spreads, or as captivating canapes.

**Maine Fisherman Potatoes Au Gratin**, a new budget casserole recipe from the Bureau of Commercial Fisheries, is a hearty and satisfying dish that could have been created by the wife of a hungry Maine fisherman. This economical dish extends two cans of flavorful sardines into a main dish entree that will feed six. Slices of cooked potatoes are layered with sardines and covered with a tasty cheese sauce. Bakes with a covering of buttery croutons for crispness, this tasty casserole will be ready to satisfy your hungry "fisherman" or family after just minutes baking. So--head for the canned fish section of your market, buy a few cans of Maine sardines and try this satisfying casserole for supper tonight. Sardines from Maine have a way of becoming a **Maine** food wherever they are tried.

### Maine Fisherman Potatoes Au Gratin

- |                                 |   |
|---------------------------------|---|
| 2 cans (3½ or 4 ounces each)    | 1 cup shredded cheese                     |
| Maine sardines                  | 2 teaspoons Worcestershire sauce          |
| 2 tablespoons chopped onion     | 5 cups sliced cooked potatoes             |
| 2 tablespoons melted fat or oil | ¾ cup soft bread cubes                    |
| 2 tablespoons flour             | 2 tablespoons butter or margarine, melted |
| 1 teaspoon salt                 | Paprika                                   |
| Dash pepper                     |   |
| 2 cups milk                     |   |

Drain sardines. Cook onion in fat until tender. Blend in flour and seasonings. Add milk gradually and cook until thickened, stirring constantly. Add cheese and Worcestershire sauce. Stir until cheese melts. Arrange half the potatoes in a well-greased, 1½ quart casserole. Cover with sardines and remaining potatoes. Pour sauce over potatoes. Toss bread cubes with butter and sprinkle over top of casserole. Sprinkle with paprika. Bake in a moderate oven, 350° F., for 25 to 30 minutes or until lightly browned. Makes 6 servings.



You can have a wide variety of **Flavor of Maine** recipes which utilize the tasty little Maine sardine. The Bureau of Commercial Fisheries has published a full-color booklet for your use. Send 35¢ to the Superintendent of Documents, United States Government Printing Office, Washington, D.C. 20402, and ask for **Flavor of Maine**, Fishery Market Development Series No. 11 (I 49,49/2:11). (Source: National Marketing Services Office, Bureau of Commercial Fisheries, U.S. Department of the Interior, 100 East Ohio Street, Rm. 526, Chicago, Illinois 60611.

# INDEX

Page	UNITED STATES:	Page	INTERNATIONAL (Contd.):
1 ..	U. S. Groundfish Industry Hurt by Imports	46 ..	Japanese Longliners Asked Not to Fish Off New Zealand
7 ..	Secretary Hickel Aids New England Haddock Fishery	46 ..	Soviet Whaling Flotilla Calls at Las Palmas
7 ..	BCF Estimates Sustained Yield & Use of Pacific Hake	47 ..	Research Vessel Visits Cape Town
7 ..	U.S. Atlantic Coast Sea Scallop Fishery Declines Further	47 ..	Adriatic Fisheries Agreement Signed
8 ..	Incidental Catch Lowered for Yellowfin Tuna	47 ..	Southeast Asia Fisheries Development Center Operations
8 ..	Purse Seining for Winter Industrial Fishery Deemed Impractical		<b>FOREIGN:</b>
9 ..	Shrimp-Separator Trawl Tests Continue		<u>Canada:</u>
9 ..	Certain Sounds Attract Sharks	48 ..	New Territorial Sea and Fishing Limit Baselines Drawn
10 ..	National Water Commission to Consult with Governors	48 ..	First-Quarter Landings in Maritime Provinces Were at 1968 Level
11 ..	BCF Lists Wrecks on Georges Bank & Nanucket Shoals.	48 ..	Fisheries Minister Warns of Overfishing Queen Crab Stocks
11 ..	Conferences Scheduled	48 ..	Government Buys Frozen Groundfish
11 ..	U.S. Fishery Products to be Promoted at Overseas Trade Shows	49 ..	Salt Fish Advisory Committee Formed
12 ..	Certified Shellfish, by J. David Clem	49 ..	Investigates Discolored Newfoundland Her- ring
	<u>Oceanography:</u>	49 ..	Conference on Fish Inspection and Quality Control
18 ..	New Ocean-Current Tracking System Tested Successfully		<u>Europe:</u>
18 ..	New Nautical Chart Issued for New England Coast		<u>USSR:</u>
20 ..	New Bathymetric Map of Bering Sea, Alaska	50 ..	May Join International Maritime Com- mittee
21 ..	Chart Entrance to Alaska's Inland Waterway	50 ..	Cooperates in International Baltic Sea Re- search
21 ..	Fluke's Migrations Are Being Tracked	50 ..	New Ichthyology Laboratory Opens
23 ..	Foreign Fishing Off U.S. in May 1969	50 ..	Fishermen Asked to Aid Academy of Sciences
	<u>States:</u>	51 ..	Polyethylene Bags Used for Freezing Fish
	<u>Alaska</u>	51 ..	New Bottom Trawl Designed
28 ..	Gov. Miller Signs 'COAST' Commission Bill	51 ..	To Exploit Northeast Atlantic Snipefish for Fish Meal
28 ..	BCF Method Spurs Kodiak's Seafood Waste Management	52 ..	Plans to Fish Hake Off Cape Town
28 ..	Pan Alaska Orders 5 Multipurpose Ves- sels	52 ..	'Vitiaz' Is on 45th Scientific Cruise
	<u>Oregon:</u>		<u>United Kingdom:</u>
28 ..	Tuna Scouts Sail Aboard 'Sunrise'	52 ..	Merger Creates Fishing Fleet of 120 Ves- sels
29 ..	Record Salmon Run to Flood-Control Reservoir		<u>Norway:</u>
30 ..	Last Part of Willamette Falls Fish Lad- der Being Built	52 ..	Frozen Fillet Exports to U.S. Increase
	<u>Maine:</u>		<u>Denmark:</u>
30 ..	Mechanized Sardine-Processing Equip- ment to Be Tested	53 ..	More Stern Trawlers for Faroe Islands
	<u>Florida:</u>	53 ..	Exports of Frozen Fillets
30 ..	University Plants 'Artificial Sea Grass'		<u>Greenland:</u>
	<u>California:</u>	53 ..	Problems Continue in Fisheries
31 ..	Fees Virtually Pay for Fish & Wildlife Conservation		<u>West Germany:</u>
31 ..	Commercial Landings & Tuna Shipments Declined in 1968	54 ..	Builds 3 Tuna Vessels for Portugal
	<u>ARTICLES:</u>		<u>Iceland:</u>
32 ..	Fishery Oceanography, by Felix Favorite	55 ..	Changing Icelandic Fisheries, by David K. Sabock
35 ..	Searching for Tuna, by Thomas Potthoff		<u>Latin America:</u>
38 ..	Economic Effects of Regulations in Maryland Oyster Fishery, by Richard E. Suttor and Thomas D. Corrigan		<u>Chile:</u>
	<u>BOOKS</u>	58 ..	Pacific Salmon Introduced into Southern Streams, by John W. DeWitt
	<u>INTERNATIONAL:</u>		<u>Surinam:</u>
45 ..	Super-Seiners Slated for West African Waters	59 ..	Shrimp Industry Is Growing
45 ..	Atlantic Albacore Fishery Developments		<u>Mexico:</u>
46 ..	FAO & USSR Sponsor Caribbean Fishery Study Tour	60 ..	Shrimp Production Declines
46 ..	Japan and Mauritania Reopen Negotiations		<u>Peru:</u>
		60 ..	Fish Meal Output & Exports Decline Slight- ly in Jan.-Apr. 1969
			<u>Brazil:</u>
		60 ..	Territorial Sea Extended to 12 Miles

Index continued page 74.

## INDEX (CONTINUED)

Page	FOREIGN (Contd.):
	<u>Asia:</u>
	<u>Japan:</u>
61 ..	Fishery Catch Set Record in 1968
61 ..	Salmon Prices Set for 1969
61 ..	Canned Tuna Production Dropped in 1968
62 ..	Seek Cause for Poor Tuna Seining in E. Pacific
62 ..	Atlantic-Caught Albacore Export Prices Rose in May
62 ..	Reorganizes Eastern Atlantic Purse-Seine Fleet
63 ..	Summer Albacore Fishery Improves, Prices High
64 ..	Southern Bluefin Fishery Developments
64 ..	King Crabbing in Bering Sea
64 ..	Seek Sauri in Eastern Pacific
64 ..	More Shellfish Culture Seabed Areas Are Developed
65 ..	May Build Tuna Seine/Pole Fishing Vessel
65 ..	Shrimp Venture in Indonesia Planned

Page	FOREIGN (Contd.):
	<u>Asia (Contd.):</u>
	<u>India:</u>
65 ..	Shrimp Trends
	<u>Mid East:</u>
	South Yemen:
66 ..	Offers Potential Fisheries Investment Opportunities
	<u>South Pacific:</u>
	American Samoa:
66 ..	Tuna Prices up in June
	<u>Africa:</u>
	South & South-West Africa:
67 ..	Fishing Industry Developments
	Senegal:
68 ..	New Seafood Plant Opens
	Zambia:
68 ..	Lake Tanganyika Fisheries to Be Developed
70 ..	Food Fish Facts (Maine Sardines)
73 ..	INDEX



## WHAT COMMERCIAL PRODUCTS OTHER THAN FISH ARE OBTAINED FROM THE SEA?

Products obtained commercially from sea water include common salt, bromine, and magnesium. All of the United States' supply of magnesium is taken from sea water, because extraction is cheaper than obtaining it from mines on land. About 75 percent of our supply of bromine is extracted from the sea.

In recent years interest has developed in exploiting the seemingly inexhaustible supply of manganese and phosphate-rich nodules on the sea floor. The American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) has estimated that there are 1.5 trillion tons of manganese nodules on the bottom of the Pacific Ocean. These nodules contain as much as 50 percent manganese plus smaller amounts of nickel, copper, cobalt, and other metals. Nodules on the sea floor appear to be forming faster than the rate at which the United States is now using manganese, nickel, and cobalt; thus it seems that our reserve of these metals is assured for many years. Phosphorite nodules off the California coast could satisfy California's phosphate fertilizer needs for many years.

Other materials obtained from the sea floor or beaches include diamonds, pearls, sand, gravel, shell, and ores of tin, thorium, and titanium.

Oil is being recovered from beneath the ocean floor in increasing amounts. In 1960, about 8 percent of the free world's oil supply was obtained from this source; by 1965, it had increased to 16 percent. Undersea deposits of sulfur are also being tapped by drilling from platforms in the Gulf of Mexico, as the supply on land dwindles. ("Questions About The Oceans," U.S. Naval Oceanographic Office.)

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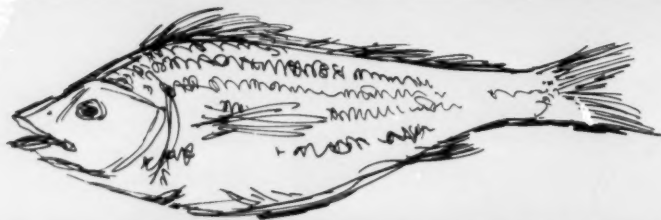
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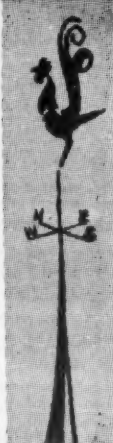
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## **fish** FOR COMPLIMENTS



Today's homemaker has become increasingly aware of the need to consider both low cost and variety in preparing meals for her family. The U.S. Department of Interior's Bureau of Commercial Fisheries has provided her with an opportunity to do this in its publication, 'Fish For Compliments on a Budget.' This 20-page booklet is designed to assist her in using fishery products for low-cost meals. It contains 18 recipes and shows how many fishery products can be prepared for delicious and inexpensive eating.

Single copies may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 for 15 cents. Purchases of 100 or more sent to one address receive a 25 percent discount.

